



**Installation and service
instructions**

DHP-AL

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Installation instructions

1 Important information/Safety regulations

-  The heat pump must be installed by authorised installation engineers and the installation must follow the applicable local rules and regulations as well as these installation instructions.
-  This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
-  Children should be supervised to ensure that they do not play with the appliance.
-  The heat pump must be located in a frost-free environment!
-  The heat pump must be placed in an area with a floor drain.
-  The heat pump must be located on a stable base. The base must be able to support the gross weight of the heat pump when filled. (see Technical Specification)

NOTE! To prevent leaks ensure that there are no stresses in the connecting pipes!

NOTE! It is important that the heating system is completely bled after installation.

NOTE! Bleed valves must be installed where necessary.

- Installation must be carried out in accordance with applicable local rules and regulations. The hot water tank must be equipped with an approved safety valve (supplied).
- Radiator systems with a closed expansion tank must also be equipped with an approved pressure gauge and safety valve, minimum DN 20, for a maximum 3 bar opening pressure, or according to country specific requirements.
- Cold and hot water pipes and overflow pipes from safety valves must be made of heat resistant and corrosion-resistant material, e.g. copper. The safety valve overflow pipes must have an open connection to the drain and visibly flow into this in a frost-free environment.
- The connecting pipe between the expansion tank and the safety valve must slope continuously upwards. A continuous upwards slope means that the pipe must not slope downwards from the horizontal at any point.
- If there is any risk of groundwater infiltration at brine pipe lead-ins, watertight grommets must be used, for more information see section "Drilling holes for brine pipes".
- In addition to applicable local rules and regulations the installation should be carried out in a manner that prevents vibrations from the heat pump being transmitted into the house causing noise.

1.1 Refrigerant

-  **Work on the refrigerant circuit must only be carried out by a certified engineer!**

Although the heat pump cooling system (refrigerant circuit) is filled with a chlorine-free and environmentally-approved refrigerant that will not affect the ozone layer, work on this system may only be carried out by authorized persons.

Fire risk

The refrigerant is not combustible or explosive in normal conditions.

Toxicity

In normal use and normal conditions the refrigerant has low toxicity. However, although the toxicity of the refrigerant is low, it can cause injury (or be highly dangerous) in abnormal circumstances or where deliberately abused. Refrigerant vapour is heavier than air and, in enclosed spaces below the level of a door for example, and in the event of leakage, concentrations can arise with a resultant risk of suffocation due to a lack of oxygen. Spaces in which heavy vapour can collect below the level of the air must therefore be well ventilated.

Refrigerant exposed to a naked flame creates a poisonous irritating gas. This gas can be detected by its odour even at concentrations below its permitted levels. Evacuate the area until it has been sufficiently ventilated.

Anyone with symptoms of poisoning from the vapour must immediately move or be moved into the fresh air.

Work on the refrigerant circuit

When repairing the refrigerant circuit, the refrigerant must not be released from the heat pump – it must be destroyed at a special plant. Draining and refilling must only be carried out using new refrigerant (for the amount of refrigerant see manufacturer's plate) through the service valves. All warranties from Danfoss AS are void if, when filling with refrigerant other than Danfoss recommended refrigerant, it has not been notified in writing that the new refrigerant is an approved replacement refrigerant together with other remedies.

Scrapping

When the heat pump is to be scrapped the refrigerant must be extracted for destruction. Local rules and regulations related to the disposal of refrigerant must be followed.

1.2 Electrical connection

-  The electric installation must only be carried out by an authorised electrician.
-  The electric installation must follow applicable local and national regulations.
-  The electrical installation must be carried out using permanently routed cables. It must be possible to isolate the power supply using an all-pole circuit breaker with a minimum contact gap of 3 mm. (The maximum load for externally connected units is 2A).
-  **Electrical current!** The terminal blocks are live and can be highly dangerous due to the risk of electric shock. The power supply must be isolated before electrical installation is started. The heat pump is connected internally at the factory, for this reason electrical installation consists mainly of the connection of the power supply.
-  **NOTE! The room temperature sensor is connected to a safety extra-low voltage.**

Follow the separate installation instructions for the room temperature sensor!

1.3 Commissioning

-  The installation may only be commissioned if the heating system, water heater and brine system have been filled and bled. Otherwise the circulation pumps can be damaged.
-  If the installation is only to be run on auxiliary heating, first ensure that the heating system is filled and that neither the brine pump nor the compressor can be started. This is carried out by setting the operating mode to ADD.HEAT.

2 Heat pump information

Delivery check

1. Check that there is no transport damage. The heat pump is packaged in cardboard.
2. Remove the plastic wrapping and check that the delivery contains the following components.

Sizes 6 kW - 10 kW:

Part no.	Quantity	Name
9680-5796A00	1	Document set
9674-57902001	1	Transparent binder
9360-47054001	1	Safety valve 9 bar 1/2"
9588-51618001	1	Kimsafe outdoor sensor 200 035
9360-56335001	1	Safety valve 1.5 bar 1/2"
9674-24735001	1	Expansion and bleed tank without valve
9551-54479001	1	Cardboard packaged top for HP
9360-51759007	1	Compression angle joint 28x28 joint
9674-54168001	1	Pipe insulation IT 9x28
3311-55300001	1	Brine in Cu pipe in TWS packaging
9684-48342001	2	Rubber bellows for 22-32mm hole
9674-54164001	1	Pipe insulation F-54-A D=54x9mm
5211-57915001	2	Flexible hose R20 L=600
9360-55453A00	1	Filler cock DN 25
9360-52488001	1	Dirt filter with shut-off DN25
9360-51738005	2	Straight connection LK 303 28xR25
9360-51738008	4	Straight compression connection 22 xR20

Sizes 12 kW :

Part no.	Quantity	Name
9680-5796A00	1	Document set
9674-57902001	1	Transparent binder
9360-47054001	1	Safety valve 9 bar 1/2"
9588-51618001	1	Kimsafe outdoor sensor 200 035
9360-56335001	1	Safety valve 1.5 bar 1/2"
9674-24735001	1	Expansion and bleed tank without valve
9551-54479001	1	Cardboard packaged top for HP
9360-51759007	1	Compression angle joint 28x28 joint
9674-54168001	1	Pipe insulation IT 9x28
3311-55300001	1	Brine in Cu pipe in TWS packaging
9684-48342001	2	Rubber bellows for 22-32mm hole
9674-54164001	1	Pipe insulation F-54-A D=54x9mm
5211-50730A00	2	Flexible hose R25 L=600
9360-56911A00	1	Filler cock DN 32
9360-52488001	1	Dirt filter with shut-off DN25
9360-51738005	4	Straight connection LK 303 28xR25
9360-51738008	2	Straight compression connection 22 xR20

The outdoor unit is supplied as a package containing:

- Outdoor unit
- Disassembled stand
- Necessary screws, nuts and washers.
- Defroster sensor

Dimensions and connections

The brine pipes can be connected on either the left or right-hand sides of the heat pump.

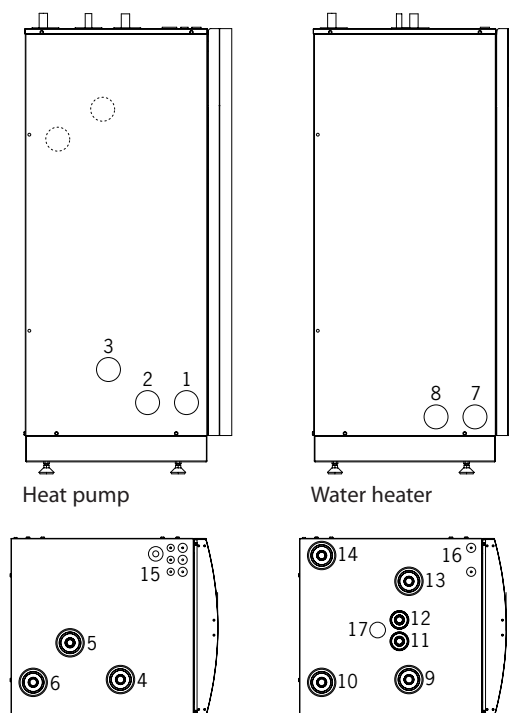


Figure 1: Dimensions and connections.

Position Name

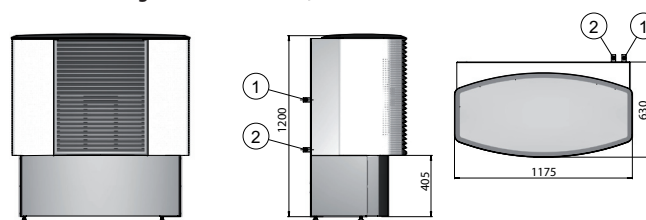
Heat pump

- 1 Brine out, during defrosting, 28 Cu
- 2 Return pipe water heater, 28 Cu
- 3 Brine in
- 4 Heating system supply pipe, 22 Cu: 6-10 kW, 28 Cu: 12 kW
- 5 Heating system return pipe, 22 Cu: 6-10 kW, 28 Cu: 12 kW
- 6 Brine out, normal operation

Water heater

- 7 Brine in, during defrosting
- 8 Water heater, return pipe
- 9 Bleed valve, at stainless steel water heater
- 10 Brine out, during defrosting
- 11 Domestic hot water, 22 Cu
- 12 Cold water
- 13 Water heater supply pipe to TWS coil
- 14 Brine, expansion line when outdoor unit is positioned at high level
- 15 Lead-in power and sensor lead
- 16 Lead-in sensor lead
- 17 Lifting point

Figure 2: Outdoor unit, Dimensions and connections.



Position Name

- 1 Brine in (HP Brine out) 28 Cu
- 2 Brine out (HP Brine in) 28 Cu

Components

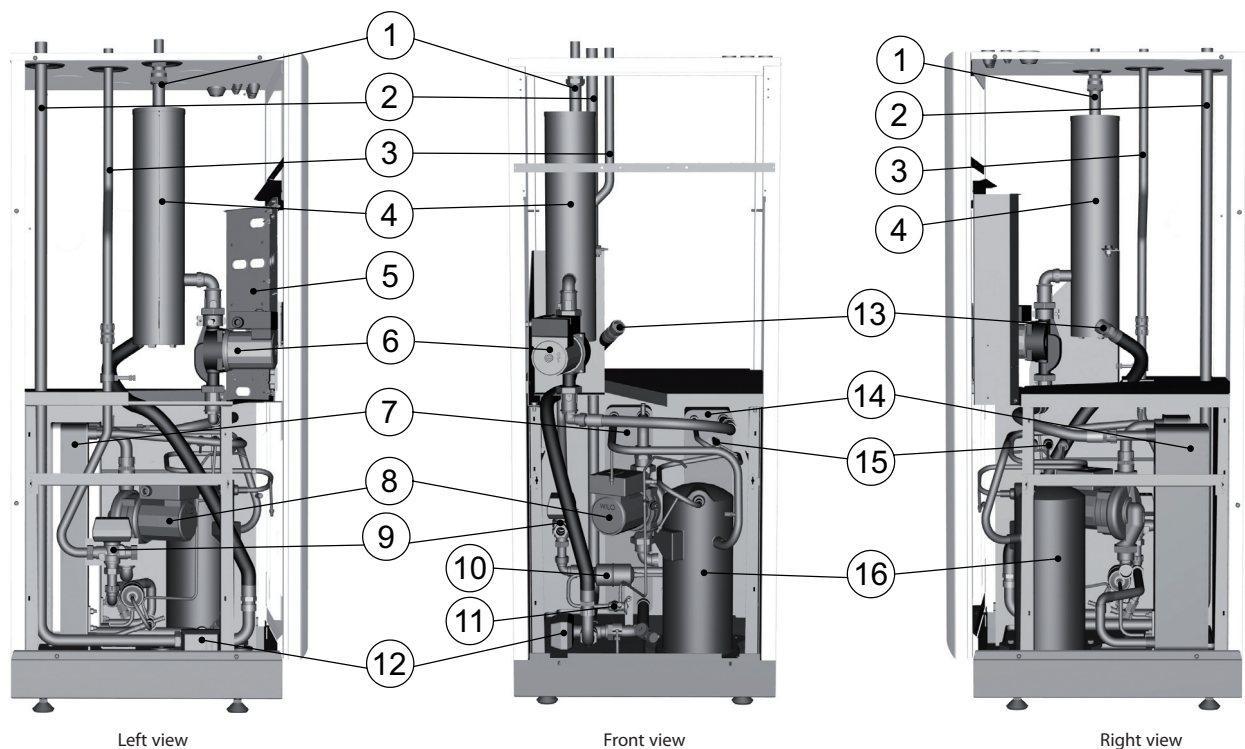


Figure 3: Components.

Position	Name
1	Heating system supply pipe
2	Brine, supply during normal operation
3	Return pipe, heating system
4	Auxiliary heating, immersion heater
5	Electrical panel
6	Heating system circulation pump
7	Evaporator
8	Circulation pump coolant system
9	Exchange valve, heating system
10	Drying filter
11	Expansion valve
12	Shunt valve defrosting
13	Brine, supply during defrosting
14	Condenser
15	High pressure and operating pressure switch
16	Compressor

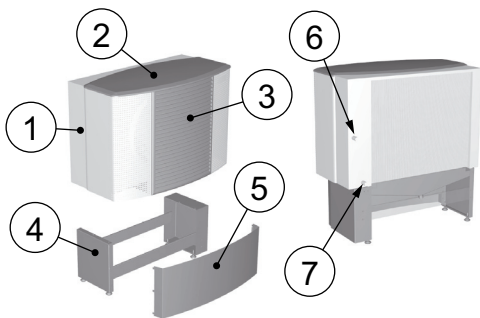


Figure 4: Outdoor unit components and connections.

Position	Name
1	Outdoor unit
2	Cover
3	Front cover
4	Stand
5	Cover
6	Connection, brine in
7	Connection, brine out

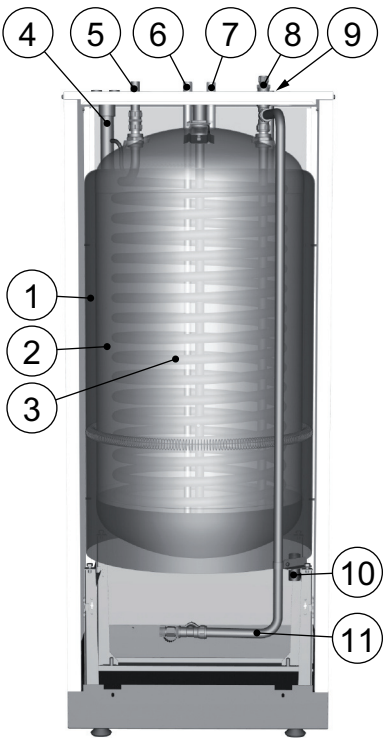
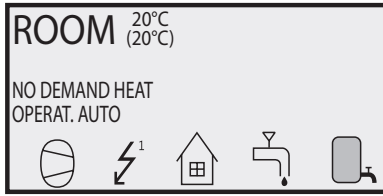


Figure 5: Water heater components and connections.

Position	Name
1	Defrosting tank
2	Water heater
3	TWS coil
4	Connection, brine, supply during defrosting
5	Bleed valve, at stainless steel water heater
6	Tap hot water
7	Cold water
8	Connection, to TWS coil
9	Connection, expansion line when outdoor unit is positioned at high level
10	Connection, brine from heat pump
11	Connection, return pipe to heat pump

2.1 Heat pump control panel

The heat pump control panel consists of a display, four control buttons and an indicator.



The symbols in the display are only examples. Certain symbols cannot be displayed at the same time.

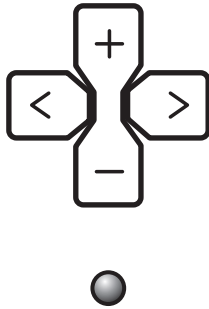


Figure 6: Display, control buttons and indicator for the heat pump.

The control computer is controlled using a user-friendly menu system, displayed in the display.

Use the four control buttons to navigate the menus and increase or reduce the set values:

- An up button with a plus sign (+)
- A down button with a minus sign (-)
- A right button with a right arrow (>)
- A left button with a left arrow (<)

The main menu, INFORMATION, is opened by pressing the left or right buttons. From INFORMATION one of the four sub-menus can be opened: OPERAT.; HEATCURVE; TEMPERATURE and OPERAT. TIME.

For installation or service, a hidden service menu, SERVICE, is used. This is opened by holding the left and right buttons depressed for three seconds. From the SERVICE menu one of the following sub-menus can be opened: WARMWATER; HEATPUMP; ADD.HEAT; MANUAL TEST and INSTALLATION.

For further information about the menus see the service instructions.

The indicator at the bottom of the control panel has two modes:

- Lit steadily, the installation has power and is ready to produce heat or hot water
- Flashing, means an active alarm

2.2 Space requirement

To facilitate the installation and subsequent testing and maintenance it is recommended that there is sufficient free space around the heat pump in accordance with the following dimensions:

- 300 mm on each side
- 300 mm above
- 600 mm in front
- 10 mm behind

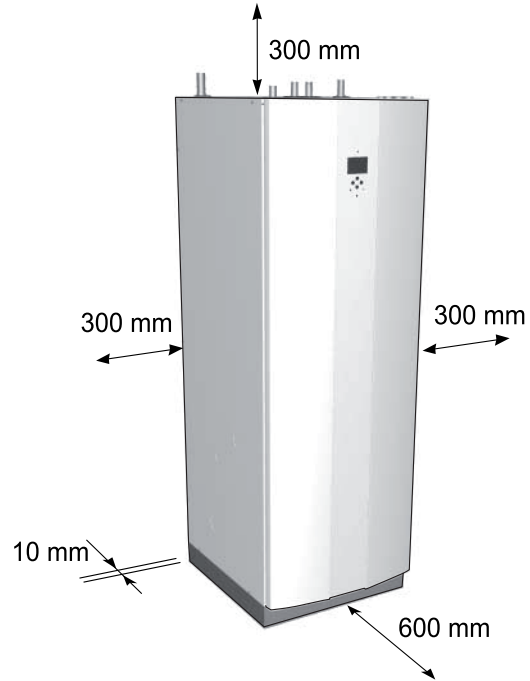


Figure 7: Necessary service space.

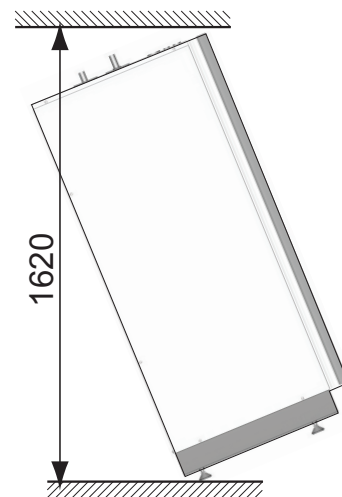


Figure 8: Minimum headroom for heat pump installation.

2.3 Recommended location



To avoid condensation problems for the brine pipes, as short a brine pipe as possible is recommended.

The heat pump should be located on a stable floor, preferably made of concrete. When locating the heat pump on a wooden floor this should be reinforced to take the weight. One solution is to place a thick metal plate, at least 6mm, under the heat pump. The metal plate should cover several joists spreading the weight of the heat pump over a larger area. If the heat pump is being installed

in a newly-built house, this has normally been taken into account during construction, and the joists where the heat pump will be located have been reinforced. Always check that this has been carried out when installing into a newly-built house. Avoid positioning the heat pump in a corner as the surrounding walls may amplify its noise. It is also important to adjust the heat pump using the adjustable feet so that it is horizontal to the base.

2.4 Space requirement around the outdoor unit

- To ensure the function of the outdoor unit, there must be at least 300 mm of space behind and 1500 mm at the front.
- For maintenance work there must be approximately 300 mm of space at the sides of the outdoor unit.

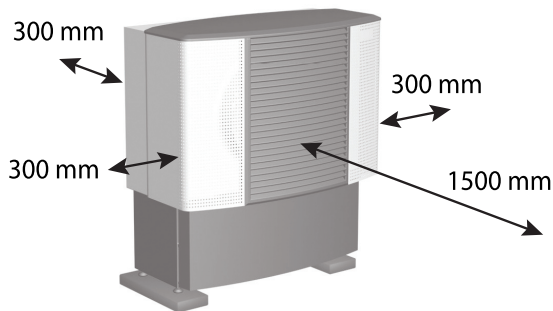


Figure 9: Necessary service space for outdoor unit.

2.5 Recommended location of outdoor unit

When positioning the outdoor unit, note the following:

- ⚠ The outdoor unit does not have to be positioned in any specific direction.
- ⚠ Noise is produced from the outdoor unit when the fan is in operation, remember this when positioning to reduce disturbance in your own home as well as to any neighbours.
- ⚠ When the outdoor unit is defrosting, water will drip straight down under the unit. The area around the outdoor unit must therefore be properly drained in order to catch the water (approximately 2 litres per defrost).
- ⚠ Remember that the outdoor unit must have a certain amount of room in order to function and for servicing, see "Heat pump information" chapter.
- ⚠ Remember that the water that drips from the outdoor unit during defrost must be able to drain into the ground. The outdoor unit must therefore not be positioned on asphalt or slabs where water cannot drain easily.
- ⚠ The outdoor unit's adjustable stand must be positioned on a secure base such as wooden sleepers, paving slabs or cast footings.

3 Drilling holes for brine pipes

- ⚠ **NOTE!** Ensure that the holes for the insert pipes are positioned so that there is room for the other installations.
- ⚠ **NOTE!** The brine pipes shall have separate lead-ins.

The brine pipes must be insulated from the heat pump, through the walls and outside the house all the way to the collector so as to avoid condensation and prevent heat loss.

If the brine pipes are to be routed above ground, drill holes in the walls for them.

If the brine pipes are to be routed below ground see the instructions below.

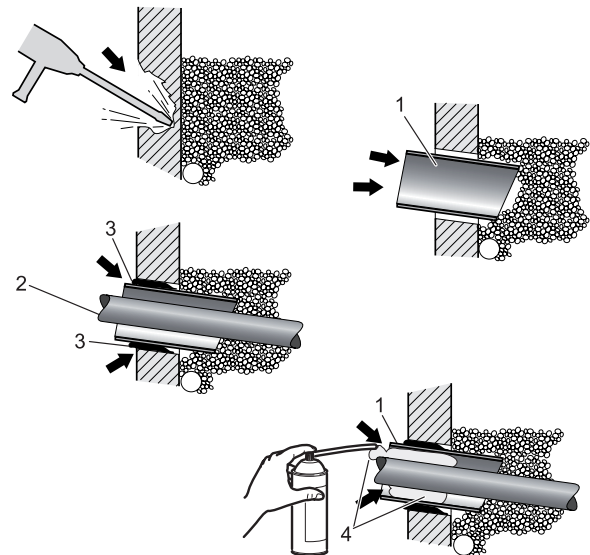


Figure 10: Drilling holes for brine pipes.

Position	Name
1	Insert pipe
2	Brine pipe
3	Mortar
4	Sealant

1. Drill holes in the wall for the insert pipes (1) for the brine pipes. Follow the dimension and connection diagrams in the section "Heat pump information". If there is any risk of groundwater infiltration at brine pipe lead-ins, watertight grommets must be used.
2. Position the insert pipes (1) in the holes sloping downwards. The inclination must be at least 1cm every 30cm. Cut them at an angle (as illustrated) so that rain water cannot get into the pipes.
3. Insert the brine pipes (2) into the insert pipes in the installation room.
4. Fill in the holes in the wall with mortar (3).
5. Ensure that the brine pipes (2) are centred in the insert pipes (1) so that the insulation is distributed equally on all sides.
6. Seal the insert pipes (1) with a suitable sealant (foam) (4).

4 Unpacking and installation

4.1 Setting up

Both the heat pump and water heater are prepared to be connected together, either to the left or right of each other.

When setting up the heat pump and water heater, the heat pump must be placed in the direction of where the brine pipes are to be connected. The water heater should then be placed on the opposite side and should be positioned next to the heat pump.

The heat pump and water heater have feet that can be adjusted 20 mm to compensate for irregularities in the surface on which they are sitting. If the surface is so irregular that the feet cannot compensate for it, the installation engineer must remedy this.

It is recommended that a condensation drain be installed from the drain pipe of the drip tray while the heat pump is on its side. The drain pipe opens through a hole in the base plate and has a Ø 10 mm hose connection.

1. Move the heat pump and water heater to the installation site.
2. Remove the packaging.

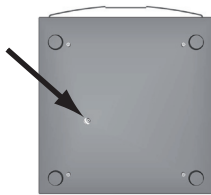


Figure 11: Condensation drain connection

3. Install a condensation drain if required.

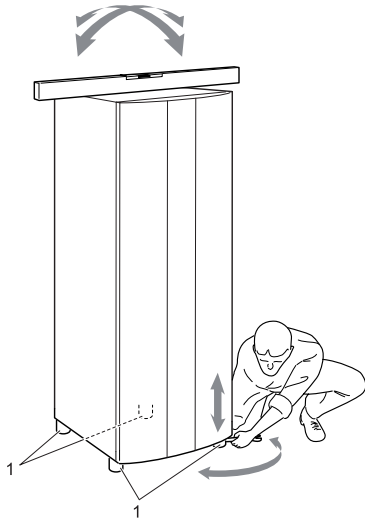


Figure 12: Adjusting the heat pump.

4. Set up the heat pump and water heater in the installation site.
5. Adjust the feet (1) so that they are horizontal.

4.2 Removing the front cover



NOTE! Do not damage the electrical wiring for the control system when the front cover is removed!

To install the heat pump and water heater, the front covers must be removed.

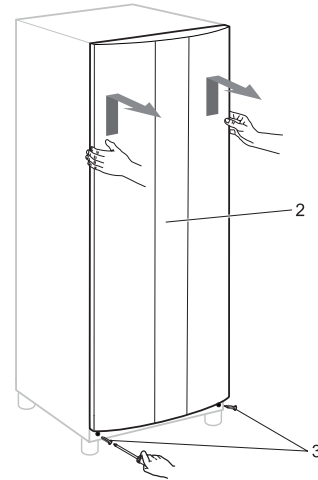


Figure 13: Removing the front cover.

1. Unscrew the screws (3).
2. Slide the front cover (2) upwards and carefully lift it off upwards and forwards.
3. Place the front cover next to the heat pump.

4.3 Unpacking and installing the outdoor unit

The outdoor unit is packed and delivered in a wooden crate.

1. Start by unpacking the unit from the wooden crate.
2. Check that the delivery is complete, it must contain the outdoor unit, front cover, cover as well as a package containing the disassembled stand including necessary screws, nuts and washers.

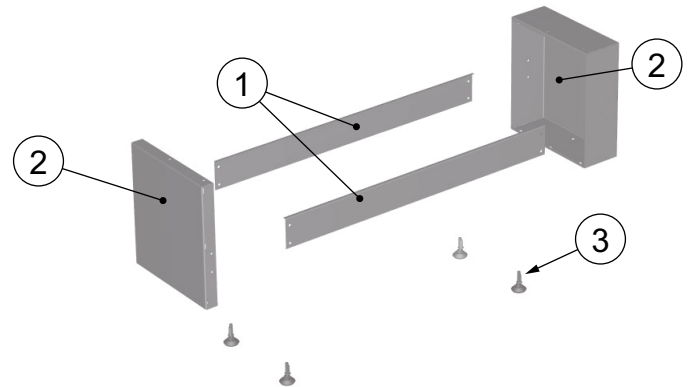


Figure 14: Assembling the stand.

3. Screw the two horizontal struts together (1) using the two ends (2). The curved edge of the horizontal struts must be facing upwards. Screws and washers for installation are supplied.
4. Press the adjustable feet (3) into the holes under the ends.
5. There are two pre-drilled holes in the bottom plate of the outdoor unit where the stand is screwed into place with 2 screws per side.

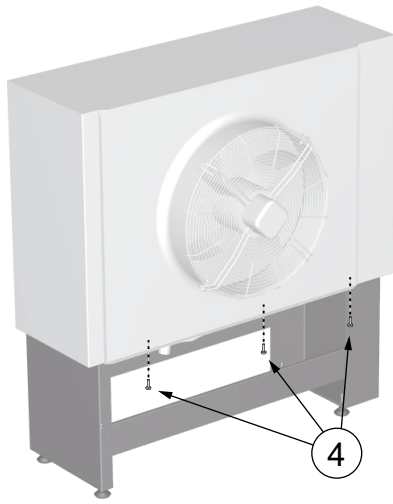


Figure 15: Front cover preparations.

- 6 Screw the three screws (4) into place from underneath in the pre-drilled holes at the front edge of the outdoor unit.
- 7 Hook the lower edge of the front cover onto the three protruding screws.
- 8 Secure the front cover using three screws in the pre-drilled holes (5).

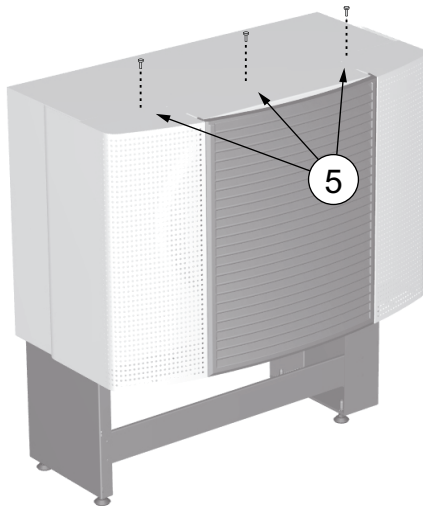


Figure 16: Tighten the front cover in place.

- 9 Hook the cover at the front edge onto the front cover (6).
- 10 Secure the cover using a screw on each side (7).

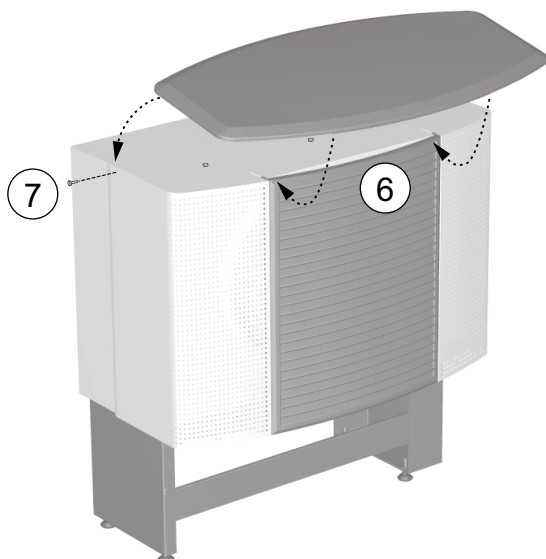


Figure 17: Secure the cover.

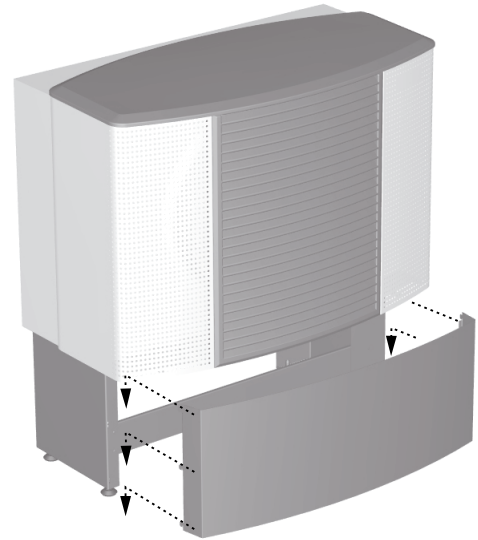


Figure 18: Finishing by installing the cover.

- 11 Hook the cover onto the stand.

NOTE! Remember that the water that drips from the outdoor unit during defrost must be able to drain into the ground. The outdoor unit must therefore not be positioned on asphalt or slabs where water cannot drain easily. If this is not possible, connect a hose to the defrosting outlet and route it away from the outdoor unit.

4.4 Installing the defroster sensor

Install the defroster sensor on the reverse of the outdoor unit.

5 Piping installation

- ⚠ NOTE! To prevent leaks ensure that there are no stresses in the connecting pipes!
- ⚠ NOTE! It is important that the heating system is completely bled after installation.
- ⚠ NOTE! Bleed valves must be installed where necessary.

- Ensure that the piping installation follows the dimension and connection diagrams in section "Heat pump information".
- Piping installation must be carried out in accordance with applicable local rules and regulations. The hot water tank must be equipped with an approved safety valve (supplied).

5.1 Connection diagram

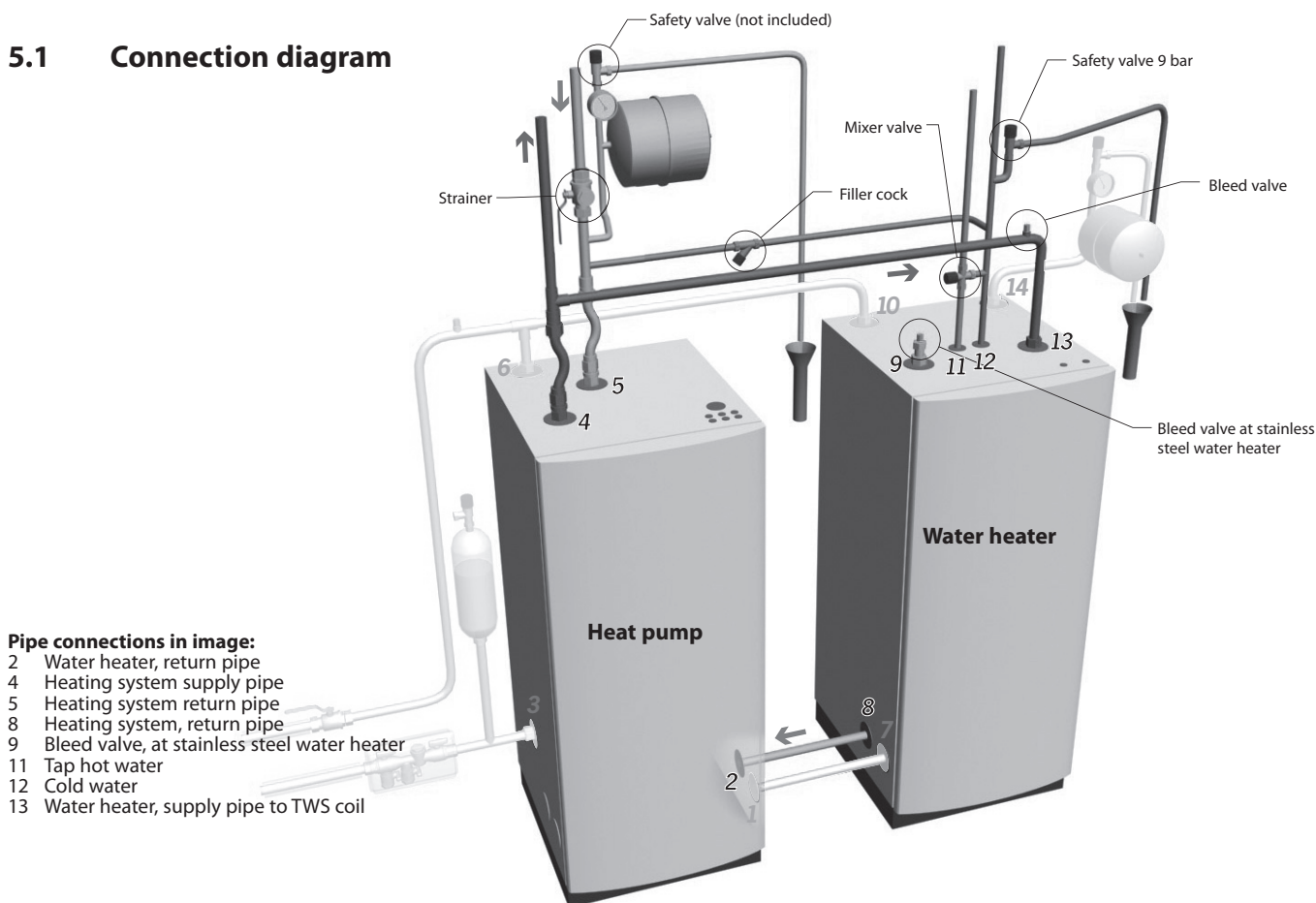


Figure 19: Principle solution for a pipe installation.

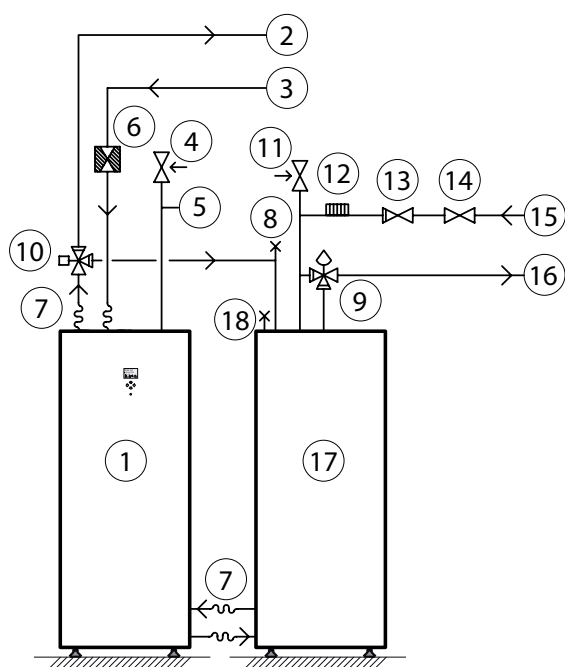


Figure 20: General connection diagram.

Position	Name
1	Heat pump
2	Supply pipe
3	Return pipe
4	Safety valve (not included)
5	Expansion tank (not included)
6	Strainer
7	Flexible hoses
8	Bleed valve
9	Mixer valve
10	Exchange valve
11	Safety valve (9 bar)
12	Vacuum valve
13	Non-return valve
14	Shut-off valve
15	Cold water
16	Hot water
17	Water heater
18	Bleed valve at stainless steel water heater

5.2 Safety valves

- Radiator systems with a closed expansion tank must also be equipped with an approved pressure gauge and safety valve, minimum DN 20, for a maximum 3 bar opening pressure, or according to country specific requirements.
- Cold and hot water pipes as well as overflow pipes from safety valves must be made of heat resistant and corrosion-resistant material, e.g. copper. The safety valve overflow pipes must have an open connection to the drain and visibly flow into this in a frost free environment.

Connecting pipe between the expansion tank and the safety valve must slope continuously upwards. A continuous upwards slope means that the pipe must not slope downwards from the horizontal at any point.

5.3 Connecting cold and hot water pipes

1. Connect the cold water and hot water pipes with all the necessary components.

5.4 Connecting supply and return pipes

If the heat pump installation is equipped with a separate water heater, an exchange valve must also be installed on the heating system's supply pipe; see above system layout.

All pipes should be routed in such a way that vibrations cannot be transmitted from the heat pump through the piping and out into the building. This also applies to the expansion pipe. To avoid the transmission of vibrations, we recommend that flexible hoses are used for the supply pipe and return pipe on both the heating system and brine system sides. Flexible hoses are available to purchase from Danfoss AS. The following figures show how appropriate and inappropriate installations look using this type of hose.

To avoid noise caused by pipe mounting, rubber-coated clamps should be used to prevent the transmission of vibrations. However, installation should not be too rigid and the clamps must not be too tight.

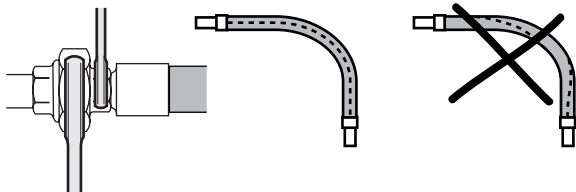


Figure 21: Do not twist the flexible hoses as they are installed. At threaded connections, use a counterhold spanner.

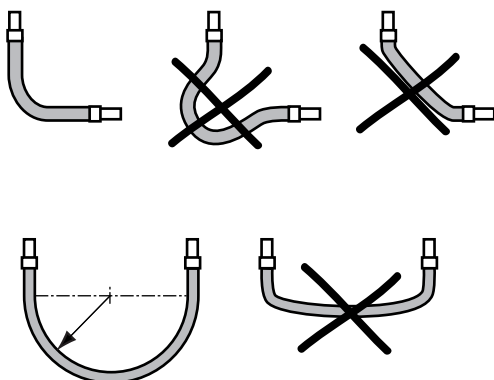


Figure 22: Cut the hose to the correct length to avoid excess bowing-out or stretching at bends.

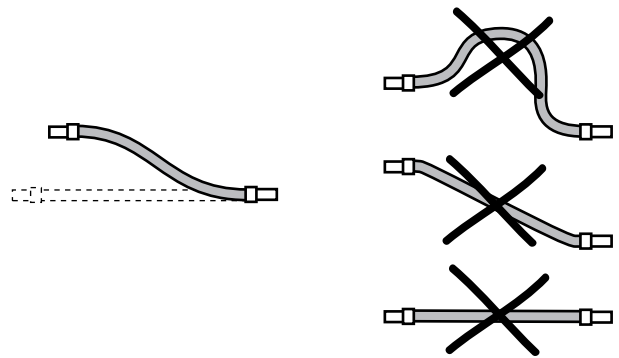


Figure 23: Cut the hose to the correct length to avoid excess bowing-out or stretching and offset the ends so that the hose is not installed completely straight.

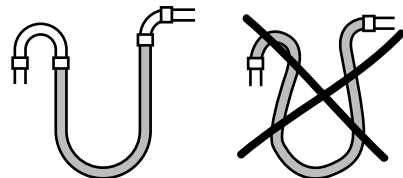


Figure 24: Use fixed pipe bends to avoid excess stress on bends next to connections.

1. Connect the supply pipe with a flexible hose connection and with all the necessary components.
2. Connect the return pipe with a flexible hose connection and with all the necessary components including a filter.
3. Insulate the supply and return pipes.
4. Connect the expansion tank to the expansion outlet (22mm Cu) on the top of the heat pump.

5.5 Fill and bleed the heating system

1. Fill the heating system with water via the filling cock to a pressure of approximately 1 bar.
2. Open all radiator valves fully.
3. Bleed all radiators.
4. Refill the heating system to a pressure of approximately 1 bar.
5. Repeat the procedure until all air has been removed.
6. Leave the radiator valves fully open.

5.6 Bleed the water heater

1. If the water heater is of the stainless steel type, it must be bled via the bleed valve on top of the water heater.

6 Electrical Installation

⚠ Electrical current! The terminal blocks are live and can be highly dangerous due to the risk of electric shock. The power supply must be isolated before electrical installation is started. The heat pump is connected internally at the factory, for this reason electrical installation consists mainly of the connection of the power supply.

- The electric installation must only be carried out by an authorised electrician.
- The electric installation must follow applicable local and national regulations.
- The electrical installation must be carried out using permanently routed cables. It must be possible to isolate the power supply using an all-pole circuit breaker with a minimum contact gap of 3 mm. (The maximum load for externally connected units is 2A).
- Electrical connection can also cause noise so this installation must be carried out appropriately. The figure below shows an appropriate installation. There is approximately 300mm free cable between the heat pump and building, however, this requires the cable to be securely installed onto the top panel so that the cable cannot be fed into the heat pump. It is inappropriate to bolt trunking between the heat pump and the wall. This is because vibrations can then be transmitted from the heat pump through the trunking to the walls of the house.

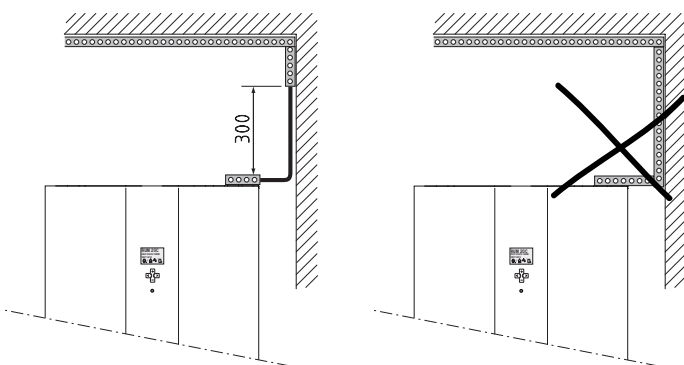


Figure 25: Recommended distance between trunking on the wall and trunking on the heat pump is 300mm.

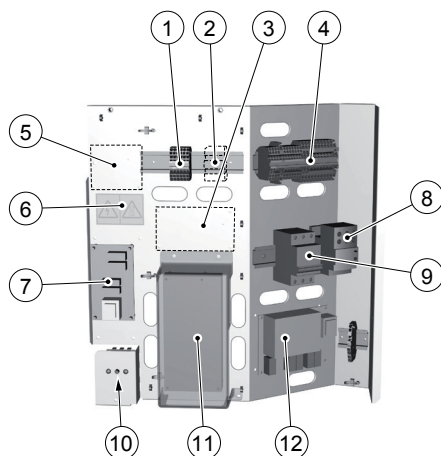


Figure 26: The location of the components on the electrical panel.

Position	Name
1	Terminal block
2	Terminal block (applies to the expansion card)
3	Space for expansion card
4	Terminal block
5	Space for Thermia/Danfoss Online
6	Warning decal
7	Defroster card
8	Contactor for compressor
9	Automatic fuses
10	Resetting overheating protection
11	Control computer
12	Soft starter card (Only available for 400 V)

6.1 Connecting the power supply, three phase 400V AC

⚠ NOTE! The power cable may only be connected to the terminal block intended for this purpose. No other terminal blocks may be used!

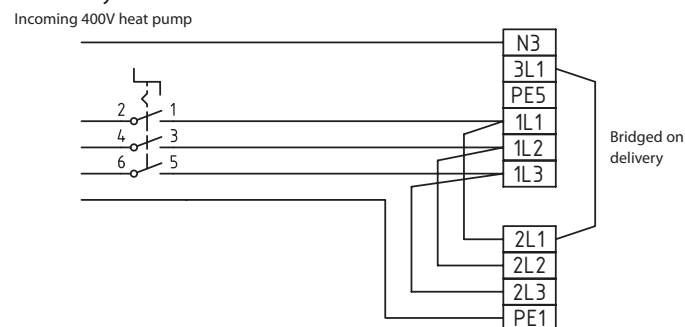


Figure 27: Incoming cable to heat pump with circuit breaker.

⚠ NOTE! Supplied with the jumpers shown in the figure.

1. Route the power cable through the opening in the top panel of the heat pump to the terminal blocks.
2. Connect the power cable to the terminal block.

6.2 Connecting the power supply, single phase 230V AC

⚠ NOTE! The power cable may only be connected to the terminal block intended for this purpose. No other terminal blocks may be used!

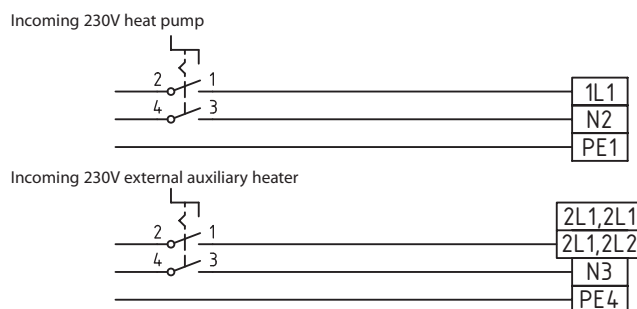


Figure 28: Incoming cable to heat pump.

1. Route the power cable through the opening in the top panel of the heat pump to the terminal blocks.
2. Connect the power cable to the terminal block.

6.3 Connecting the outdoor sensor

⚠ NOTE! The outdoor sensor is connected with extra low protection voltage. Follow the specific installation instructions for the outdoor sensor!

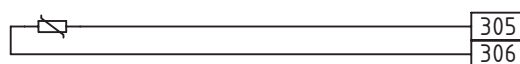


Figure 29: Connecting the outdoor sensor.

- Position the outdoor sensor on the north or north west side of the house.
- To measure the outdoor temperature as accurately as possible, the sensor must be positioned 2/3 of the way up the facade on houses up to three storeys high. For higher buildings, the sensor should be positioned between the second and third storeys. Its location must not be completely protected from the wind but not in a direct draft. The outdoor sensor should not be placed on reflective panel walls.
- The sensor must be positioned at least 1 m from openings in the walls that emit hot air.

- If the sensor cable is connected through a pipe, the pipe must be sealed so that the sensor is not affected by outgoing air.

Then connect the sensor to the heat pump control system in accordance with the instructions below.

1. Route the outdoor sensor connection cable through the cable bushing in the top panel to the terminal block.
2. Connect the sensor to the terminal blocks according to the connection diagram.

6.4 Changing the language in the control computer

If necessary, change the language in the control computer menus.

1. Ensure that the main circuit breaker is on.
2. Open the SERVICE menu by pressing and for three seconds.
3. Change language in the control computer menu SERVICE -> INSTALLATION -> ENGLISH, select language and .

6.5 Changing the number of auxiliary heating power stages

NOTE! Setting the maximum permitted number of power stages for the auxiliary heating must be carried out.

1. Ensure that the main circuit breaker is on.
2. Open the SERVICE menu by pressing and for three seconds.
3. Change the number of auxiliary heating power stages in the control computer menu SERVICE -> ADD.HEAT -> MAXSTEP, select the number of stages and .

6.6 Connecting the outdoor unit

NOTE! The power cable may only be connected to the terminal block intended for this purpose. No other terminal blocks may be used!

For correct connection between the heat pump and the outdoor unit, 6 connections must be made. For more information about connection, see separate sheet with electrical instructions.

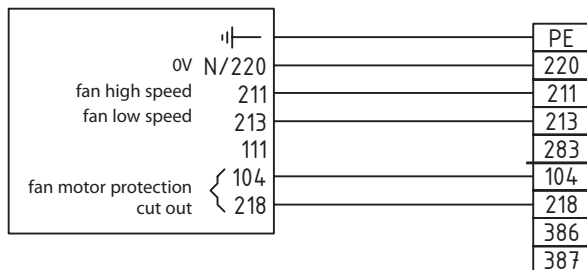


Figure 30: Connecting the outdoor unit.

1. Route the power cable through the opening in the top panel of the heat pump to the terminal blocks.
2. Connect the power cable to the terminal block.

6.7 Connecting the defroster sensor

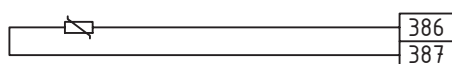


Figure 31: Connecting the defroster sensor.

Position the defroster sensor on the reverse of the outdoor unit.

1. Route the defroster sensor connection cable through the cable bushing in the top panel to the terminal block.
2. Connect the sensor to the terminal blocks according to the connection diagram.

6.8 Connecting the exchange valve

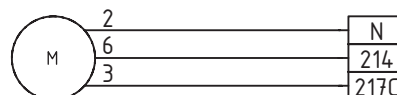


Figure 32: Connecting the exchange valve.

1. Route the exchange valve's connection cable through the cable bushing in the top panel to the terminal block.
2. Connect the exchange valve to the terminal blocks according to the connection diagram.

7 Brine installation

7.1 Connection diagram

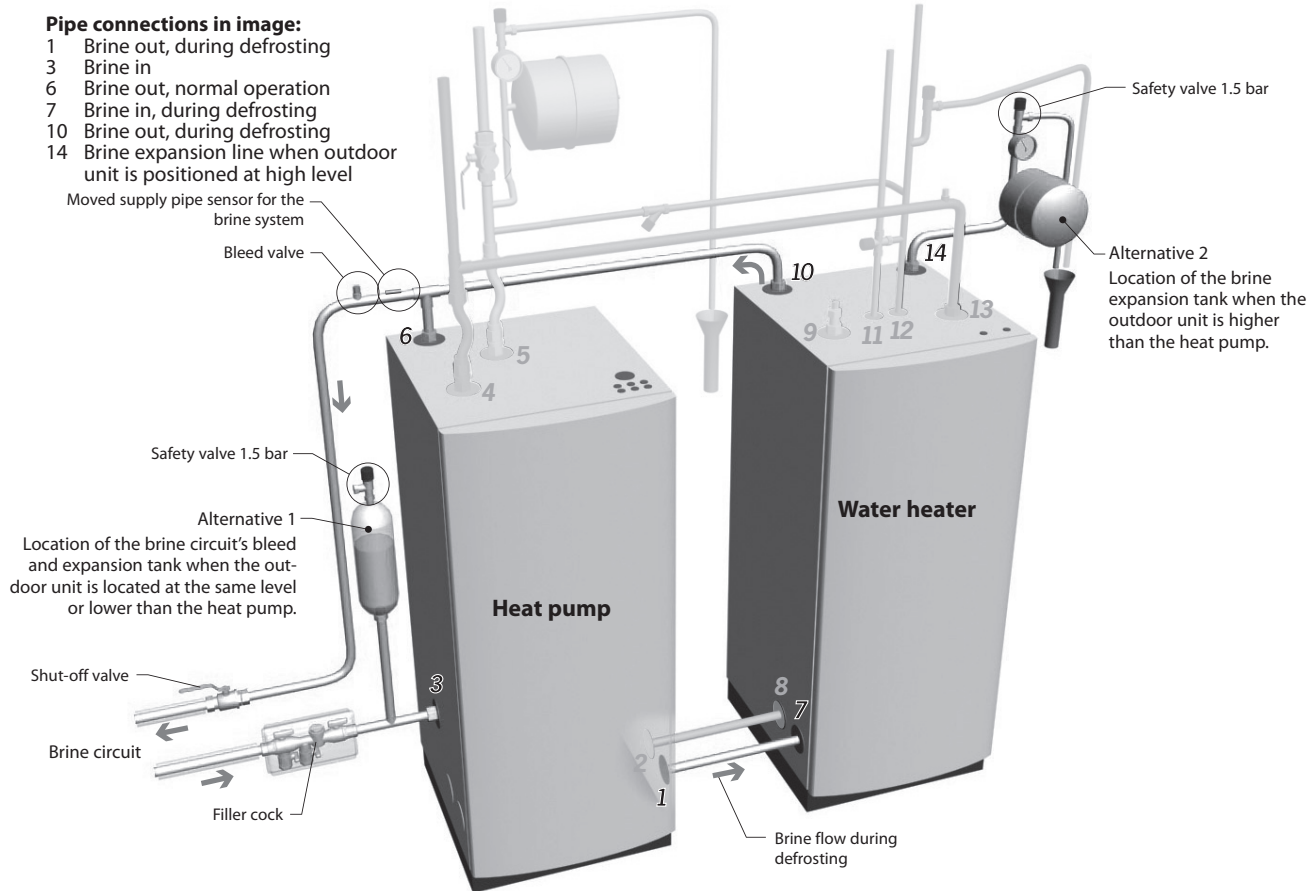


Figure 33: Principle solution for pipe installation.

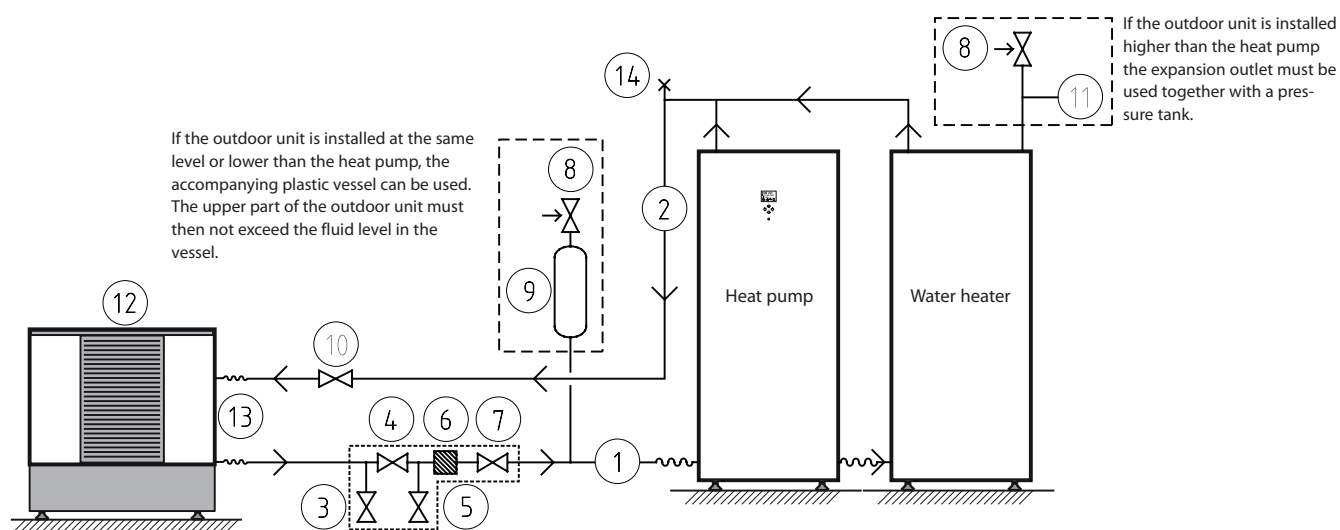


Figure 34: Connection diagram for brine pipes.

Position Name

1	Return pipe, brine
2	Supply pipe, brine
3	Shut-off valve (part of the filler cock)
4	Shut-off valve (part of the filler cock)
5	Shut-off valve (part of the filler cock)
6	Strainer (part of the filler cock)
7	Shut-off valve (part of the filler cock)

8	Safety valve (1.5 bar)
9	Bleed and expansion tank
10	Shut-off valve
11	Pressure tank
12	Outdoor unit
13	Flexible hoses (not included)
14	Bleed valve (not included)

7.4 Bleeding and post filling the brine circuit

 **NOTE!** When topping up, the brine pump must be running.

1. Start the brine pump in the control computer menu SERVICE -> MANUAL TEST -> BRINEPUMP, set the value to 1.
2. Check that the level in the bleed tank (9) has stabilised. If the level is not stable there is air in the system.
3. Dismantle the safety valve (8) on the bleed tank.
4. Top up with brine to 2/3 of the tank through the connection on which the safety valve (8) was installed.
5. Leave the brine pump running so that the air in the system collects in the bleed tank.
6. As air separates in the bleed tank the fluid level drops, top up as in step 4.
7. Reinstall the valve (8) when all air has been removed from the system..
8. Open valve (8) and release any overpressure. The fluid level should not fall below 2/3 of the height of the tank.
9. Check that valve (3) is closed.
10. Stop the brine pump in the control computer menu SERVICE -> MANUAL TEST -> BRINEPUMP, set the value to 0.
11. Switch to the desired operating mode if the heating system has been filled and bled.

Collect any excess brine in a plastic container for topping up the system if necessary (leave it with the customer).

8 Installing accessories/additional functions

8.1 Room temperature sensor

 **NOTE!** The room temperature sensor is connected to a safety extra-low voltage.

1. Install the room temperature sensor somewhere in the house where the room temperature is relatively constant, not in a hallway, kitchen or a room with alternative heating.
2. Hang a thermometer next to the room temperature sensor in order to calibrate it after connecting it.

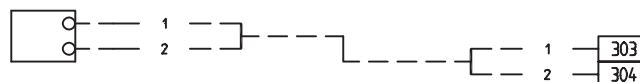


Figure 37: Connecting the room temperature sensor.

3. Connect the room temperature sensor to terminal blocks 303 and 304.
4. After connecting the room temperature sensor, it is calibrated by holding in all buttons for 15 seconds and then setting the actual room temperature that the thermometer shows.

If the display shows "—" no outdoor temperature has been read.

8.2 EVU function

The EVU function prevents the operation of HEATPUMP, ADD.HEAT and CIRC.PUMP as long as the contact is closed. The text EVU STOP is shown in the display when this function is active.

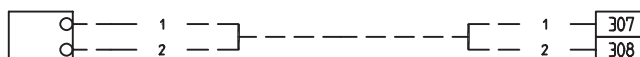


Figure 38: Connection diagram for the EVU function.

- Function EVU is activated by making a connection between terminal blocks 307 and 308 using an external 1-pin timer.

8.3 Tariff control

The room temperature lowering function provides a regular, temporary lowering of the indoor temperature.

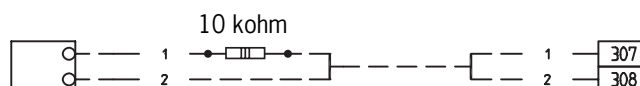


Figure 39: Connection diagram for the tariff control function.

- The tariff control is activated by making a connection between terminal blocks 307 and 308 using an external 1-pin timer and a 10 kohm resistor.
- The extent to which the temperature is lowered is set in the menu INFORMATION -> Heatcurve -> REDUCTION.

8.4 Higher hot water temperature

 **NOTE!** Never connect the heat pump to provide a higher temperature unless the heating or hot water systems require it. Higher temperatures increase the load on the heat pump.

If necessary, the heat pump can be connected to produce hotter water for the heating system and hot water system when it is installed.

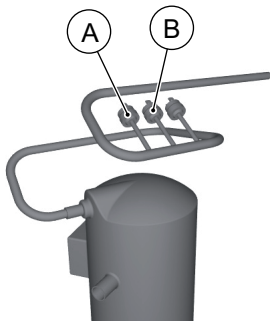


Figure 40: The pressure switches are installed on the compressor's pressure pipe.

1. Move the grey cables, which are normally connected to pressure switch A, to pressure switch B.

9 Start up

NOTE! Read the safety instructions!



The installation may only be commissioned if the heating system, water heater and brine system have been filled and bled. Otherwise the circulation pumps can be damaged.



If the installation is only to be run on auxiliary heating, first ensure that the heating system is filled and bled and that neither the brine pump nor the compressor can be started. This is carried out by setting the operating mode to ADD.HEAT.

9.1 Installation checklist

Before manual test operation check the following points:

Piping installation, heating system

- Pipe connections in accordance with the connection diagram
- Flexible hoses on the supply and return pipes
- Pipe insulation
- Strainer on return pipe, heating system
- Bleeding of the heating system
- All radiator valves fully open
- Expansion tank heating system (not included in the delivery)
- Safety valve for expansion tank (not included in the delivery)
- Filler cock, heating system (not included in the delivery)
- Leakage inspection
- Exchange valve
- Safety valve for cold water (9 bar)

Electrical Installation

- Circuit-breaker
- Fuse protection
- Direction of rotation of the compressor
- Coolant pump
- Outdoor unit
- Defroster sensor
- Positioning of the outdoor sensor
- Control computer settings
- Exchange valve

Brine system

- Expansion/bleed tank on the return pipe when the outdoor unit is located at the same level or lower than the heat pump.
- Pressure tank connected to expansion tank on water heater when the outdoor unit is higher than the heat pump.
- Safety valve (1.5 bar) on the expansion/bleed tank
- Filler cock on the return pipe
- Insulation in the outside wall lead-in
- Other brine pipe insulation
- Bleeding of brine system
- Leakage inspection

9.2 Manual test

Test operate and at the same time check the function of the tested components.

Activate MANUAL TEST

1. Ensure that the main circuit breaker is on.
2. Select operating mode  (OFF), in the menu INFORMATION -> OPERAT.-> .
3. Open the SERVICE menu by pressing  and  for three seconds.

4. Set the value for MANUAL TEST to 2.



NOTE! Select position 2 to navigate away from the MANUAL TEST menu during ongoing test operation!

Test the brine pump

5. Start the brine system's brine pump by setting the value BRINEPUMP to 1.
6. Check that the brine pump is running by:
 - listening
 - putting a hand on the pump
 - checking that the level in the expansion tank is stable. If the level is not stable there is air in the system.
 - listen for air
7. If the pump does not start see the section, "Starting circulation pumps manually".
8. If there is air in the brine system, bleed according to section, "Bleeding the brine circuit".
9. Stop the brine pump by setting the value back to 0.

Test the circulation pump

10. Start the heating system circulation pump by setting the value CIRC.PUMP to 1.
11. Check that the circulation pump is running by:
 - listening
 - putting a hand on the pump
 - listen for air
12. If the pump does not start see the section, "Starting circulation pumps manually".
13. If there is air in the heating system, bleed according to section, "Bleeding the heating system".
14. Stop the circulation pump by setting the value back to 0.

Test the external exchange valve

15. Activate the 3-way valve by setting the value VXV WARMWATER to 1.
16. Check that the arm on the 3-way valve changes position.
17. If the arm does not change position, see the "Troubleshooting" section in the service instructions.

Test the compressor

18. Start the circulation pump by setting the value CIRC.PUMP to 1
19. Start the heat pump compressor by setting the value HEATPUMP to 1. At the same time as the value is set to 1 for HEATPUMP the brine pump starts.

 **NOTE!** Risk of burns, the pipe can reach 70-80°C!



Figure 41: The pressure pipe should get hot during operation.

20. Check that:

- the compressor is running in the right direction by putting a hand on the pressure pipe and checking that it is hot.
- it sounds normal and there is no noise.

21. If the pipe does not get hot, or if it sounds abnormal, see the "Troubleshooting" section in the service instructions.

22. Stop the compressor by setting the value back to 0.

23. Stop the brine pump by setting the value back to 0.

24. Stop the circulation pump by setting the value back to 0.

Testing the auxiliary heating power stages

25. Start the circulation pump by setting the value CIRC.PUMP to 1

26. Start the first auxiliary heating power stage by setting the value ADD.HEAT 1 to 1.

27. Check that the auxiliary heating power stage works by leaving the menu MANUAL TEST and going into the menu INFORMATION -> TEMPERATURE -> SUPPLY and check that the temperature rises.

28. Return to the menu MANUAL TEST and stop ADD.HEAT 1 by setting the value to 0.

29. Repeat steps 26 to 28 for ADD.HEAT 2 and ADD.HEAT 3.

30. Stop the circulation pump by setting the value back to 0.

Test fuse protection

31. Start the circulation pump by setting the value CIRC.PUMP to 1

32. Start the compressor by setting the value HEATPUMP to 1.

33. At the same time, start the auxiliary heating power stages available to check that the fuse protection can withstand full power operation.

34. Stop the auxiliary heating power stages and the compressor by setting the value back to 0.

35. Stop the circulation pump by setting the value back to 0.

Test the outdoor unit

36. Start the fan at low speed by setting the FAN L value to 1. Check that the fan runs at low speed.

37. Start the fan at high speed by setting the FAN H value to 1. Check that the fan runs at high speed.

Exit test operation

38. Set the value for MANUAL TEST to 0.

Starting circulation pumps manually

If any of the circulation pumps do not start, it may need to be helped as follows:

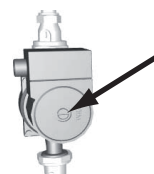


Figure 42: Bleed screw location.

1. Open and remove the bleed screw on the front of the pump. Normally a small amount of water comes out when it is removed.
2. Insert a flat blade screwdriver and turn it in the direction of rotation of the pump (clockwise).
3. Reinstall the bleed screw with its rubber seal.

Adaptation to the heating system

Adjust the heat pump settings to the applicable heating system, for instance an underfloor heating or radiator system. The delta temperature must be at least 8°C above the heat pump. The delta temperature should be 3-5°C for the brine system. If none of the delta temperatures are reached, the flow of the circulation pumps may need adjusting depending on the applicable heating system.

Noise check

During transportation and installation there is a certain risk that the heat pump can be damaged, components may move or get bent and this can cause noise. Because of this it is important to check the heat pump when it has been installed and is ready to be commissioned to ensure that everything seems in order. The heat pump should be run in both heating and hot water modes to ensure that there is no abnormal noise. While doing this, check that there is no abnormal noise in other parts of the house.

Noise is produced from the outdoor unit when the fan is in operation, check during that manual operation that there is no disturbance in your own home as well as to any neighbours.

Select operating mode

Set the heat pump to the desired operating mode in the menu INFORMATION -> OPERAT. If necessary, set certain parameters in the control computer, such as ROOM and CURVE.

9.3 Installing the front cover

 **NOTE!** Take care not to damage the front cover!

1. Align the upper section of the front cover with both the side channels at the top of the unit and slide it carefully downwards until it covers the entire front of the unit.
2. Tighten the screws.

9.4 After start up

 **NOTE!** Remember that it takes time for the heat pump to heat a cold house. It is best to let the heat pump work at its own pace and NOT raise or alter any values in the control computer to try to heat it up more rapidly.

 Any alarms that may occur in connection with the installation can be fault-traced in the "Troubleshooting" section in the service instructions.

10 Handover to customer

After installation and test operation, the customer must be informed about their new heat pump installation. Below is a checklist regarding the information that you must give the customer:

- The model of the heat pump that has been installed
- Run through the Maintenance instructions and show what it contains
- Describe the various operating modes and what they mean
- Describe the most common alarms and corrective actions
- Demonstrate how to navigate the control computer and which settings the customer can set themselves
- Demonstrate how to view history and operating times
- Show the pipe installation and go through the periodic maintenance actions that the customers must be aware of:
 - recommended pressure on manometers
 - fill the heating system
 - exercise safety valves
 - clean strainers
- Explain how the customer can fine adjust their existing heating system according to the instructions in the maintenance instructions
- The applicable warranties
- Where the customer is to turn for servicing

Service instructions

11 The heat pump

11.1 General function description

A heat pump utilises the free solar energy found in a natural heat source, such as rock, ground, ground water or air.. The heat pump can be compared to a reversed refrigerator. In a refrigerator, heat is transferred from the inside of the refrigerator to the outside. In a heat pump the heat that is stored in a heat source is transferred to the inside of the house. The heat pump uses the energy in the heat source and gives back three to four times more heat energy than what it uses in electrical energy. The heat pump is, therefore, a very environmentally friendly and economical way of heating a house.

In order for the heat pump to be able to retrieve heating energy from the heat source and transfer it to the heating system of the house, three separate fluid circuits are required.

The circuit that retrieves the heating energy from the heat source is called the brine circuit and it maintains a low outgoing temperature to be heated by the heat source.

The next circuit is called the refrigerant circuit and is a closed circuit which, through compression and expansion, takes the retrieved heating energy and transfers it to the last circuit, the heat transfer fluid circuit.

The heat transfer fluid circuit holds the fluid that circulates in the heating system of the house and in the heat pump's water heater.

The figure below shows how the different circuits work together in the transfer of heating energy.

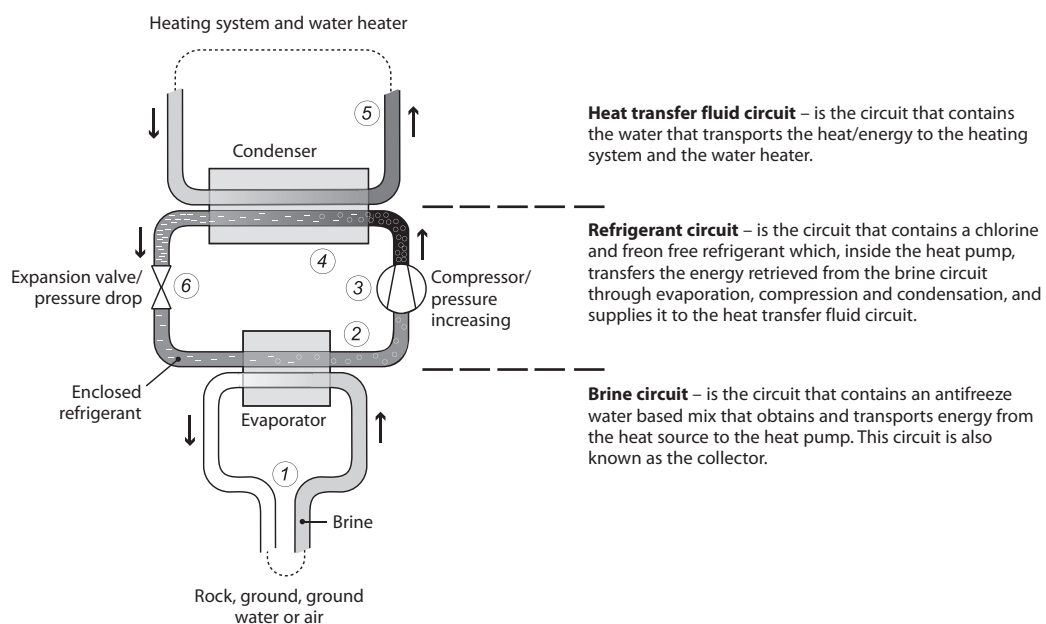


Figure 43: Function principles of a heat pump.

- 1 A hose filled with fluid (brine) is routed to a heat source. The brine obtains energy from the heat source by the fluid temperature in the hose being heated a few degrees by the surrounding heat source. The fluid filled hose is also known as a collector.
- 2 The brine is routed into the first of the heat pump's heat exchangers (evaporator). The enclosed refrigerant in the refrigerant circuit is forced to boil as the pressure in the expansion valve drops and later evaporates to a gas in the evaporator. The energy produced during this process is released by the slightly heated brine.
- 3 The refrigerant that now contains a large quantity of energy in the form of heat is transferred to the compressor, which both increases its temperature and pressure.
- 4 The refrigerant then continues into the second heat exchanger (condenser). When condensing, the refrigerant supplies its heat energy to the heat transfer fluid circuit. The refrigerant's temperature decreases and returns to a liquid state.
- 5 The heat transfer fluid circuit transports the heat energy out to the radiators, under floor heating or the fan convector system, which heat up.
- 6 The refrigerant is then transported through the expansion valve where the pressure drops and the refrigerant starts to boil and then the process starts again.

11.2 Components

DHP-AL is a heat pump installation for both heating and producing domestic hot water for the home. The heat pump uses outdoor air as a heat source and retrieves energy from the air using an air heat exchanger in a separate outdoor unit.

The compressor in the heat pump is first compressor on the market that is specially developed for heat pumps. It also has an integrated electrical heating element which provides auxiliary heat that can be used when the heating requirement exceeds the capacity of the heat pump. The heat pump supplies as much of the heat demand as possible before auxiliary heating is engaged and assists.

The heat pump is equipped with control equipment, which is controlled via a control panel. The control equipment controls the heat pump unit's included components (compressor, circulation pumps, auxiliary heater and outdoor unit) and determines when to start and stop the pump as well as producing heat and cooling for the house.

Heat enters the house via a water borne heating system, a low temperature system. One is used to cool the house. The heat pump's function for cooling connects automatically when the outdoor temperature exceeds the set parameter.

The heat pump unit consists of five basic units:

1 Heat pump unit

- Scroll compressor
- Stainless steel heat exchanger (evaporator and condenser)
- Circulation pumps for brine and heating systems
- Valves and safety equipment and corresponding electrical components.

2 Auxiliary heat

- 15 kW electric heating element (4.5 kW at 230 V heat pump installation)
- Electric heating element control in a maximum of five steps (three steps for 230 V heat pump installation)
- Installed on the heating system's supply pipe
- Covers the demand of extra energy if the heat pump's capacity is exceeded
- Automatically connected in the heat pump unit if operating mode AUTO is selected.

3 Control equipment (not shown in the figure)

- Control computer with graphic display
- Temperature sensors (outdoor, supply pipe, return pipe, brine and hot water)
- Room sensor (option)

4 Water heater

- Water heater with defrosting tank

5 Outdoor unit

- Air heat exchanger
- Fan

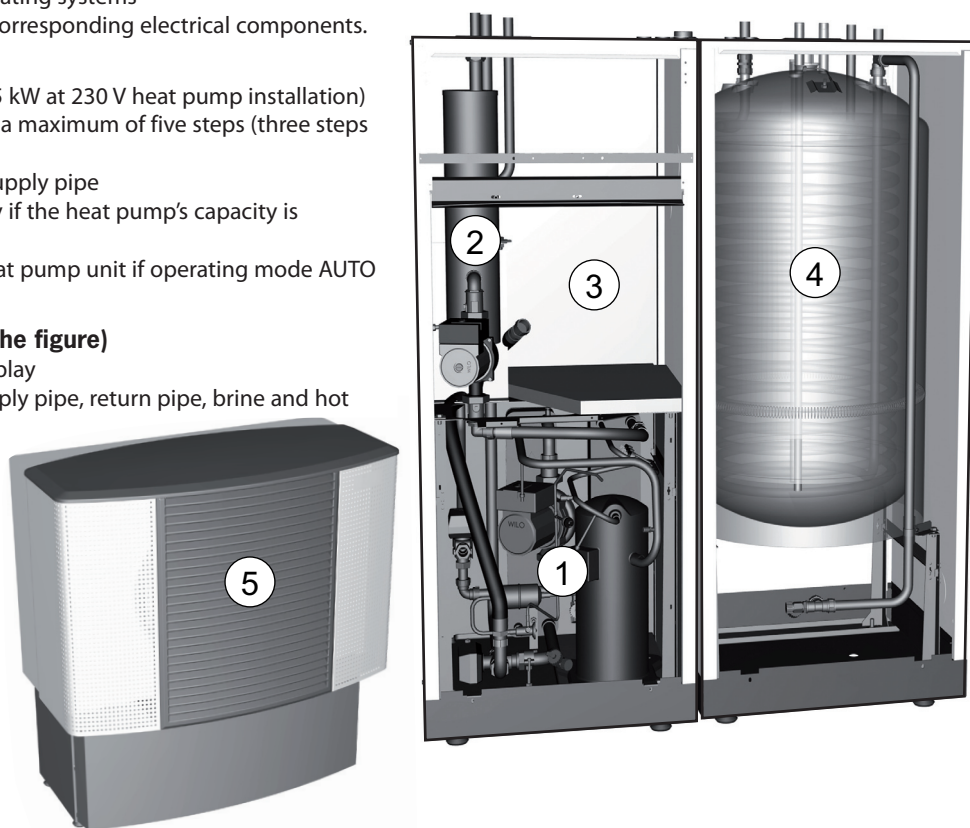


Figure 44: The basic units of the heat pump.

11.3 Outdoor unit

Because the heat source for DHP-AL is outdoor air, the heat pump is equipped with an outdoor unit where the brine circuit retrieves energy from the air. During operation, cold brine is heated in the air heat exchanger. To speed up brine heating, the outdoor unit is equipped with a fan which increases the air flow through the air heat exchanger. The fan is controlled at two speeds by the control equipment in the heat pump.

11.4 Heating

Heating is active when the outdoor temperature is the same as or greater than 17°C (adjustable value for HEAT STOP) and other operating conditions are met, see the "Operating conditions" section for more information. When the outdoor temperature is greater than 17°C heating stops.

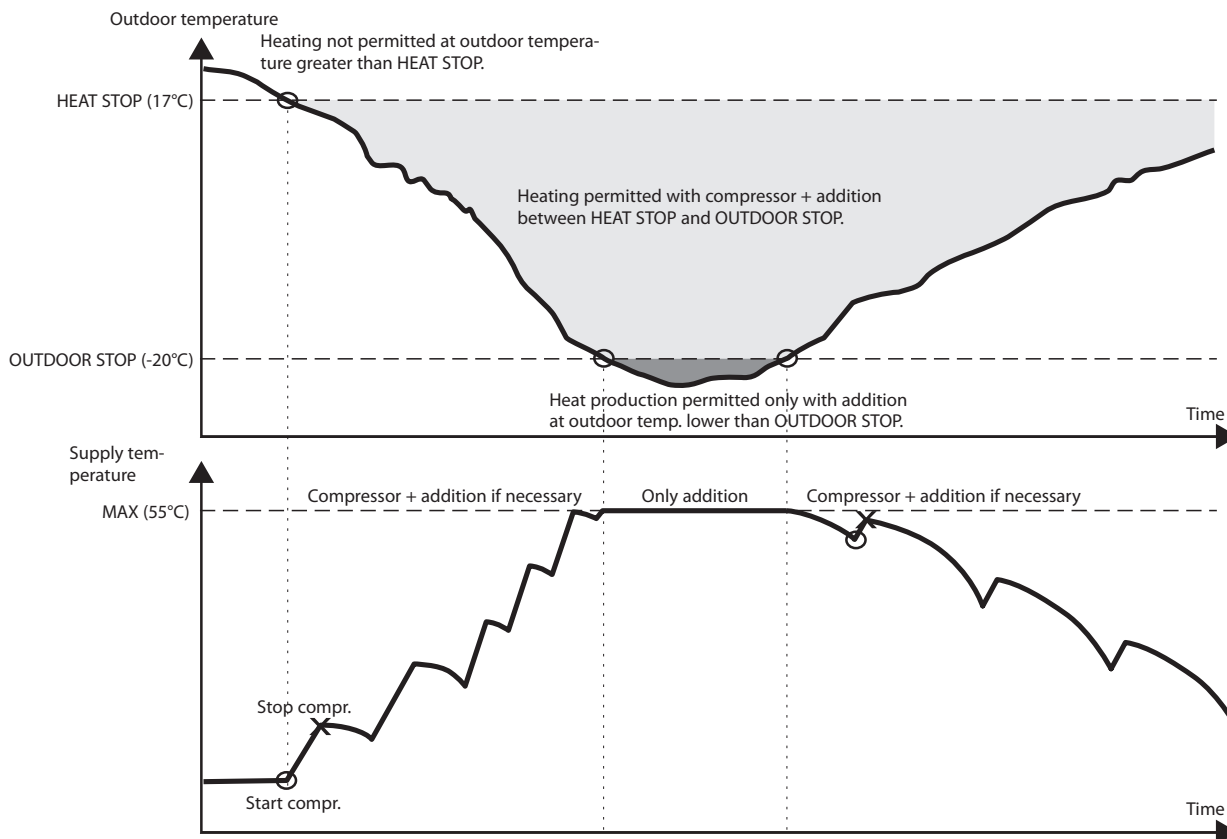


Figure 45: Operating conditions for heating (The values between brackets are the default values).

The figure above shows DHP-AL operating for heating. When heating during the winter months, the outdoor unit's air heat exchanger is cooled by the energy exchange at the same time as the humidity causes it to become covered in frost. DHP-AL has an automatic function to defrost the air heat exchanger using the produced heat energy. If necessary, a defrosting sequence starts which means the following:

- The defrosting sequence starts when the temperature of the brine reaches its set parameter for defrosting
- The compressor runs when a start signal initializes the defrosting sequence
- An exchange valve in the heat pump shifts the direction of flow of the brine so that the fluid flows through the water heater jacket where the heated brine is stored
- The heated brine melts the frost on the outside of the air heat exchanger
- When the brine returns from the outdoor unit, a temperature of 11°C is maintained so that the air heat exchanger is defrosted sufficiently
- The exchange valve shifts back the direction of flow of the brine so that normal flow can be resumed
- Operation returns to normal heating

11.5 Auxiliary heater 400V

The auxiliary heater is made up of an electric heating element on the supply pipe that has three outputs, ADD.HEAT 1, ADD.HEAT 2 and ADD.HEAT 3, and can be controlled in five steps:

- Step 1 = ADD.HEAT 1 = 3 kW
- Step 2 = ADD.HEAT 2 = 6 kW
- Step 3 = ADD.HEAT 1 + ADD.HEAT 2 = 9 kW
- Step 4 = ADD.HEAT 2 + ADD.HEAT 3 = 12 kW
- Step 5 = ADD.HEAT 1 + ADD.HEAT 2 + ADD.HEAT 3 = 15 kW

In the event of an alarm, the auxiliary heater engages automatically.

11.6 Auxiliary heater 230V

The auxiliary heater is made up of an electric heating element on the supply pipe that has two outputs, ADD.HEAT 1 and ADD.HEAT 2, and can be controlled in three steps:

- Step 1 = ADD.HEAT 1 = 1.5 kW
- Step 2 = ADD.HEAT 2 = 3 kW
- Step 3 = ADD.HEAT 1 + ADD.HEAT 2 = 4.5 kW

In the event of an alarm, the auxiliary heater engages automatically.

11.7 Important parameters

Heat production - calculating

The indoor temperature is adjusted by changing the heat pump's heat curve, which is the control computer's tool for calculating what the supply temperature should be for water that is sent out in the heating system. The heat curve calculates the supply temperature depending on the outdoor temperature. The lower the outdoor temperature, the higher the supply temperature. In other words, the supply temperature of the water fed to the heating system will increase exponentially as the outside air temperature falls.

The heat curve will be adjusted in connection with installation. It must be adapted later on, however, to obtain a pleasant indoor temperature in any weather conditions. A correctly set heat curve reduces maintenance and saves energy.

CURVE

The control computer shows the value for CURVE by means of a graph in the display. You can set the heat curve by adjusting the CURVE value. The CURVE value indicates the supply temperature of the water to be sent out to the heating system at an outdoor temperature of 0°C.

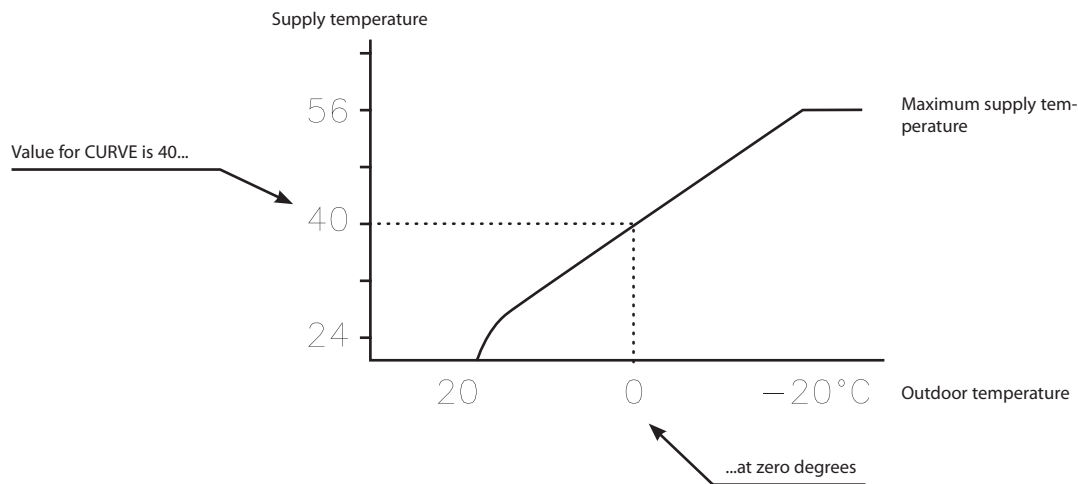


Figure 46: Graph showing the set value 40 for CURVE.

At outdoor temperatures colder than 0°C, supply water hotter than 40°C is sent out to the heating system and at outdoor temperatures greater than 0°C, supply water cooler than 40°C is sent out.

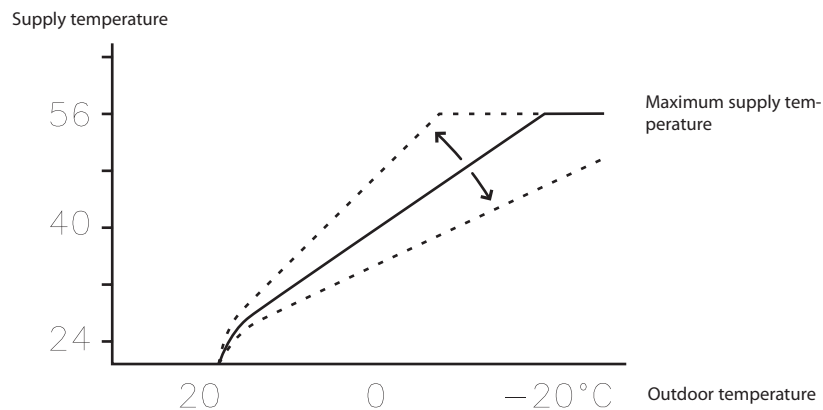


Figure 47: Increasing or reducing the CURVE changes the slope of the curve

If you increase the CURVE value, the heat curve will become steeper and when you reduce it, it will become flatter.

The most energy efficient and cost effective setting is achieved by changing the CURVE value to adjust the temperature in the house to an even and constant temperature. For a temporary increase or reduction, adjust the ROOM value instead.

ROOM

If you wish to increase or reduce the indoor temperature, change the ROOM value. The difference between changing the ROOM value and the CURVE value is that the system's heat curve does not become steeper or flatter if the ROOM value is changed, which the curve becomes if the CURVE value changes, instead the entire heat curve is moved by 3°C for every degree change of the ROOM value. The reason that the curve is adjusted 3° is that an approximate 3° increase in supply temperature is needed to increase the indoor temperature 1°.

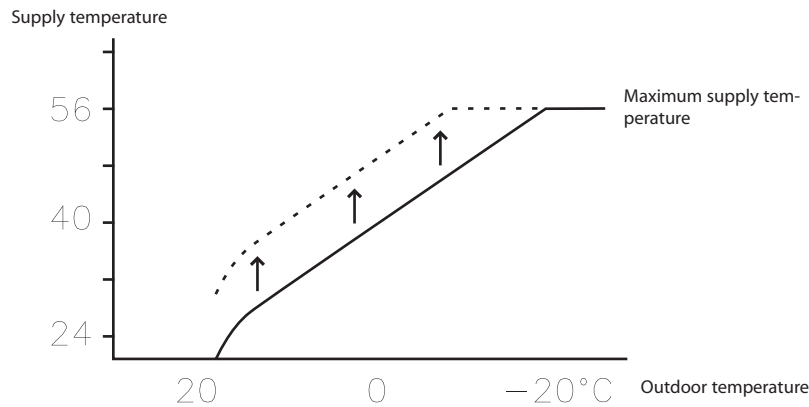


Figure 48: Changing the ROOM value changes the heat curve upwards or downwards.

The relationship of the supply temperature to outdoor temperature will not be affected. The supply temperature will be increased or reduced by the same number of degrees all along the heat curve. I.E. the entire heat curve rises or drops instead of the curve gradient changing.

This method of adjusting the indoor temperatures must only be used for a temporary raise or drop. For long term increases or reductions of the indoor temperature, the heat curve is adjusted instead.

Sometimes, at outdoor temperatures between -5°C and +5°C, part of the heat curve may need adjusting if the indoor temperature is not constant. For this reason, the control system includes a function adjusting the curve at three outdoor temperatures: -5°C, 0°C and +5°C. This function will allow you to increase or reduce the supply temperature, without affecting the heat curve, at three specific outdoor temperatures. If, for example, the outdoor temperature is -5°C, the supply temperature will change gradually between 0°C and -10°C, maximum adjustment being reached at -5°C. The figure below shows the adjusted CURVE -5. The adjustment can be seen in the graph in the form of a bump.

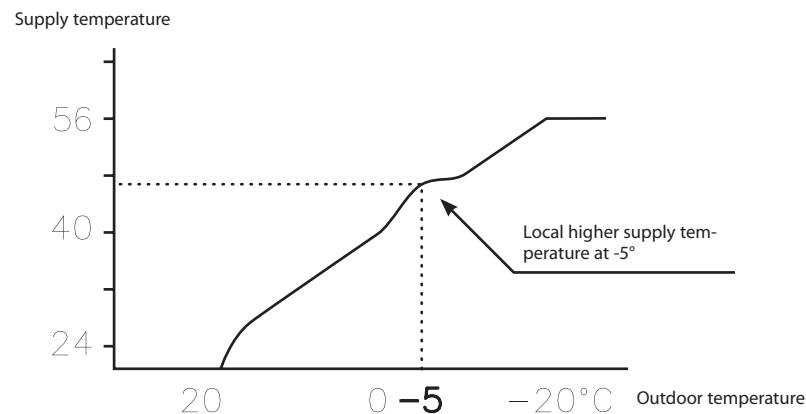


Figure 49: The adjusted curve at -5°C

You can choose to adjust the heat curve individually at three specified outdoor temperatures: -5°C, 0°C and +5°C. The supply temperature can be changed by plus/minus 5 degrees.

HEATSTOP

The HEATSTOP function automatically stops all production of radiator heat or under floor heating when the outdoor temperature is equal to, or higher than, the value entered for heat stop.

When the heat stop function is activated, the circulation pump will be turned off - except when hot water is being produced. The circulation pump will be "exercised" for 1 minute per day. The factory set value for activating heat stop is an outdoor temperature of 17°C. If the heat stop function is active, the outdoor temperature must drop 3°C when setting, before the heat stop stops.

MIN and MAX

The MIN and MAX values are the lowest, respectively highest set point values that are allowed for the supply temperature.

Adjusting the minimum and maximum supply temperatures is particularly important if your home has under floor heating.

If your house has under floor heating and parquet floors, the supply temperature must not exceed 45°C. Otherwise there is a risk that the parquet floors might be damaged. If you have under floor heating and stone tiles, the MIN value should be 22-25°C, even in summer when no heating is required. This is to achieve a comfortable floor temperature.

If your house has a basement, the MIN value should be adjusted to a suitable temperature for the basement in summer. A condition for

maintaining the heat in the basement in the summer is that all radiators have thermostat valves that switch off the heat in the rest of the house. It is extremely important that the heating system and the radiator valves are trimmed correctly. As it is usually the end customers themselves who have to carry out trimming, remember to inform them how to carry it out correctly. Also remember that the value for HEATSTOP needs adjusting upwards for summer heating.

TEMPERATURES

The heat pump can display a graph showing the history of the various sensors' temperatures and you can see how they have changed over 60 measurement points in time. The time interval between the measurement points can be adjusted between one minute and one hour, factory setting is one minute.

History is available for all sensors, but only the set value is shown in the display for the room sensor. The integral value that may appear is the heating system's energy balance.

INTEGRAL

The heat demand in the house depends on the season and weather conditions and is not constant. The heat demand can be expressed as temperature difference over time and can be calculated giving an integral value as a result (heat demand). To calculate the integral value, the control computer uses several parameters.

A heat deficit is needed to start the heat pump, and there are two integral values, A1 and A2, which start the compressor and auxiliary heater. During heat production, the deficit reduces and when the heat pump stops, the inertia in the system causes a surplus of heat.

The integral value is a measurement of the surface under the time axle and is expressed in degree minutes. The figure below shows the factory settings for the integral values that the heat pump has. When the integral value has reached the set value for INTEGRAL A1, the compressor starts and if the integral value does not drop but continues to rise, the auxiliary heater starts when the integral value has reached the set value for INTEGRAL A2.

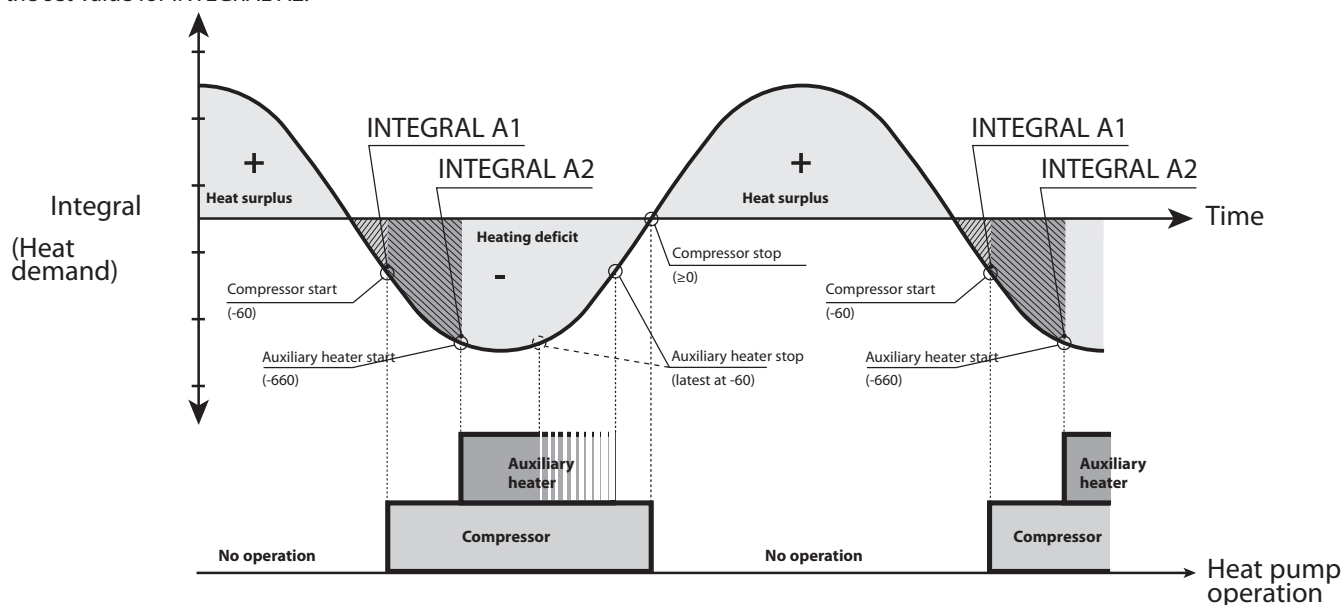


Figure 50: Starting and stopping heat pump operation based on integral values.

The integral value calculation stops during hot water production and during heat stop. Integral value calculation resumes two minutes after completed hot water production to give the heating system time to stabilise the temperature.

More specific conditions for starting and stopping the heat pump are described in the "Operating conditions" chapter.

HYSTERESIS

In order to start the heat pump in advance during sudden changes of the heat demand, there is a value, HYSTERESIS, which controls the difference between the actual supply temperature, t_1 and the calculated supply temperature, t_2 . If the difference is the same or greater than the set HYSTERESIS value (x), i.e. there is a heat demand, or the heat demand disappears, quicker than the usual integral calculation, the integral value is forced to either the start value INTEGRAL A1 or to the stop value 0°min .

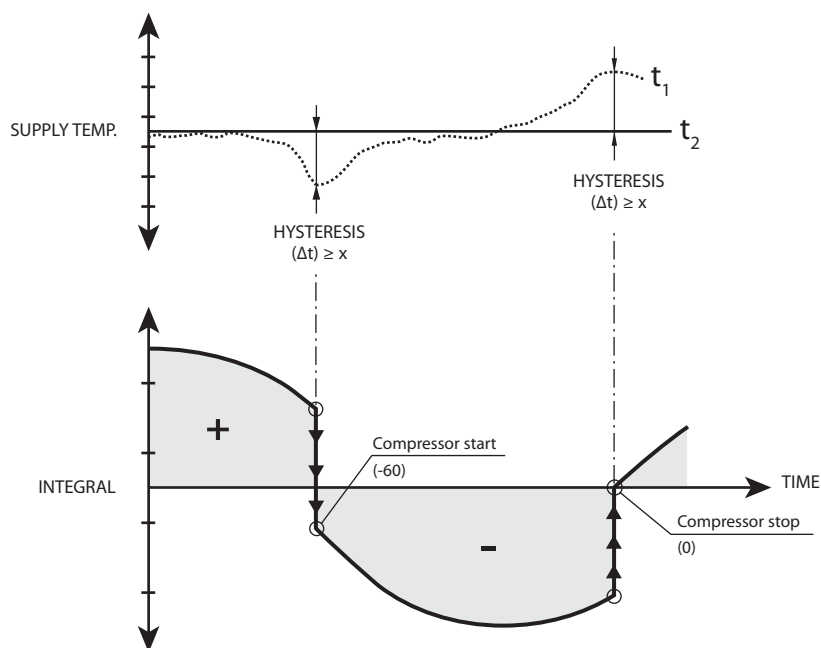


Figure 51: Conditions for HYSTERESIS to force the integral value to change.

12 Control computer

12.1 Function description

A control computer is used to automatically calculate the heat demand in the house where the heat pump is installed and to ensure that the correct amount of heat is produced and emitted where necessary. There are many different values (parameters) that must be referred to during the calculation of the heat demand. During installation use the control computer to set and change certain values that have to be adapted according to the house demand. The control computer is also used during service to view alarms and history, and to check the value settings. The display window, keypad and an indicator are on the front of the control computer. It consists of a simple menu system that is used to navigate the desired settings and values.

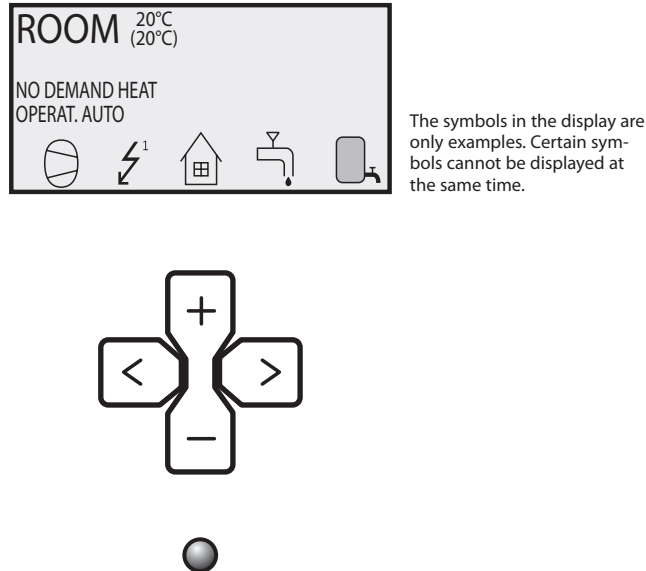


Figure 52: Display, control buttons and indicator for the heat pump.

Use the four control buttons on the keypad to navigate the menus and increase or reduce the set values:

- An up button with a plus sign (+)
- A down button with a minus sign (-)
- A right button with a right arrow (>)
- A left button with a left arrow (<)

The display always shows the set ROOM value and the status of the heat pump.

There are two main menus that are used to affect the heat pump settings. The menus are designed for two categories of user, end customers and installers, who make different settings in the control computer. For this reason the service menu is hidden from end customers.

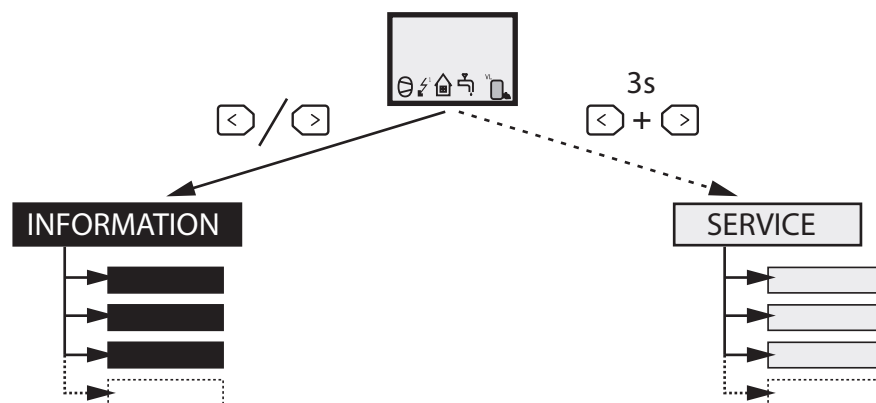


Figure 53: The menus are reached via different button presses.

The main menu, INFORMATION, is opened by pressing the left or right buttons. From the INFORMATION menu you can open the sub menus to make settings for the heat pump.

For installation or service, the hidden menu, SERVICE, is used. This is opened by holding the left and right buttons depressed for three seconds. From the service menu you can open sub menus to make advanced settings.

12.2 Display

The display of the control computer shows information about the heat pump's operation, status and any alarms, in text form. The status, indicated by symbols, is also shown in the lower section which shows the heat pump's active process.

Operating mode

Appears with applicable heat pump operating status text.

Operating mode	Meaning
 (OFF)	The installation is fully switched off.  Remember that if the operating mode OFF is to be used for long periods during the winter, the water in the heating system in the installation must be drained, otherwise there is a risk of frost damage.
AUTO	The heat pump and the auxiliary heater are automatically controlled by the control computer.
HEATPUMP	The control computer is controlled so that only the heat pump unit (compressor) is allowed to operate.
ADD. HEAT	The control computer only permits the auxiliary heater to be in operation. This operating mode can be used when a new installation is being used, when the brine system is not ready for operation.
HOT WATER	In this mode the heat pump only produces hot water, no heat goes to the heating system.

Symbols

Displays the operating status of the heat pump using symbols.

Symbol	Meaning
 HP	Indicates that the compressor is in operation. An "F" next to the symbol indicates that a flow switch is installed.
 LIGHTNING	Indicates that the auxiliary heater is in operation. Number of auxiliary power stages indicated by digit.
 HOUSE	Indicates that the 3-way valve position is for heat production for the house.
 TAP	Indicates that the 3-way valve's position is for hot water production.
VL	SYSTEM
 CLOCK	Indicates that tariff control is active.
 TANK	Indicates the level of hot water in the water heater. During charging, the tank is filled and filling starts at the set start temperature. A lightning symbol by the symbol indicates peak heating charging (legionella function).
 SQUARE	Either indicates that the operating pressure switch has deployed, or that the hot gas temperature has reached its maximum temperature.
 DEFROST	Displayed if defrosting is active.
 FAN	Displayed if the fan is active L=Low speed and H= High speed.

Text

Appears with applicable heat pump operating status text.

Message	Meaning
ROOM --°C	Shows the set ROOM value. Standard value: 20°C. If the accessory room sensor is installed it shows the desired indoor temperature within brackets and the actual temperature.
ERR PHASE SEQ.	Alarm that indicates that there is an incorrect phase sequence to the compressor. Only display and only the first 10 minutes.
HIGH RETURN	Alarm that indicates that the high return temperature prevents the compressor's operation.
START	Indicates that there is a demand for heating production and that no start delay is active.
EVU STOP	Indicates that the additional function EVU is active. This means that the heat pump is off as long as EVU is active.

Message	Meaning
NO DEMAND HEAT	Indicates that there is no heating production demand.
HIGHPRESS ERROR	Alarm that indicates that the high pressure switch has deployed.
LOWPRESS ERROR	Alarm that indicates that the low pressure switch has deployed.
MOTOR P ERROR	Alarm that indicates that the motor protection has deployed.
BRINEFLOW LOW	Appears if the accessory flow switch is installed. Alarm that indicates that the flow in the brine system is low.
SENSOR	Alarm that indicates a faulty sensor.
HEATPUMP START --MIN	Indicates that there is a heating production demand and will start in the specified number of minutes.
HEATPUMP+ADD.HEAT	Indicates that heat production is active with both compressor and auxiliary heater.
START_MIN	Indicates that there is a demand for heating production but that a start delay is active.
ADD. HEAT	Indicates that there is an auxiliary heater demand.
DEFROST	Displayed if defrosting is active.

13 Menus

13.1 Main menu INFORMATION

This menu is used to change the heat pump's operating modes and adjust the heat curve. History and operating times can also be viewed here. Open the menu by pressing the left or right button. The sub menus available in the INFORMATION menu are shown in the following table:

Main menu	Sub menu	Selection/settings
INFORMATION		
	OPERATION	
		Ø AUTO HEATPUMP ADD. HEAT HOT WATER (MANUAL TEST)
	HEATCURVE	
		CURVE MIN MAX CURVE +5 CURVE 0 CURVE -5 HEATSTOP REDUCTION ROOM FACTOR <i>POOL</i> <i>POOL HYSTERESIS</i>
	HEAT CURVE 2 (<i>Expansion card</i>)	
		<i>CURVE 2</i> <i>MIN</i> <i>MAX</i>
	TEMPERATURE	
		OUTDOOR ROOM SUPPLY PIPE RETURN PIPE HOT WATER INTEGRAL BRINE OUT BRINE IN <i>POOL</i> <i>SHUNTGROUP</i> <i>COOLING</i> <i>CURRENT</i>
	OPERAT.TIME	
		HEATPUMP ADD. HEAT 1 ADD. HEAT 2 ADD. HEAT 3 HOT WATER COOLING COOLING A
	DEFROST	
		DEFROSTS BETW. 2 DEFR TIME SINCE DEFROST FAN H OFF AT DEFROST CURVE MANUEL DEFR

Menus in italics are only visible if the expansion card is installed.

Sub menu INFORMATION -> OPERATION

Used to select operating mode.

Menu selection	Meaning	Factory setting
 (OFF)	The installation is off. Any active alarms reset.	-
AUTO	Automatic operation with both heat pump and auxiliary heater permitted. If the number of power stages for auxiliary heating are set to zero (SERVICE -> AUX. HEAT -> MAX STAGE) only AUTO or OFF can be selected as operating mode.	-
HEATPUMP	Operation with only heat pump permitted. NOTE! No peak heating charging (legionella function) with only heat pump operation.	-
ADD. HEAT	Operation with only auxiliary heater permitted.	-
HOT WATER	Operation with heat pump for hot water production and auxiliary heater during peak heating charging (legionella function).	-
MANUAL TEST	Only appears when MANUAL TEST in the SERVICE menu is active. Outputs controlled manually.	-

Sub menu INFORMATION -> HEAT CURVE

Used to change settings for the heat curve.

Menu selection	Meaning	Factory setting
CURVE	Calculated supply temperature at 0°C outdoor temperature. Shown as a graph that also shows MIN and MAX values.	40°C (during under floor heating 30°C) (interval: 22°C / 56°C)
MIN	Minimum permitted supply temperature, if the temperature for heat stop has been reached and the heat pump has stopped.	10°C (interval: 10°C - 50°C)
MAX	Maximum permitted supply temperature.	55°C (during under floor heating 45°C) (interval: 40°C / 85°C)
CURVE 5	Local increase or reduction of CURVE at an outdoor temperature of +5°C. Shown in the graph for CURVE.	0°C (interval: -5°C / 5°C)
CURVE 0	Local increase or reduction of CURVE at an outdoor temperature of 0°C. Shown in the graph for CURVE.	0°C (interval: -5°C / 5°C)
CURVE -5	Local increase or reduction of CURVE at an outdoor temperature of -5°C. Shown in the graph for CURVE.	0°C (interval: -5°C / 5°C)
HEATSTOP	Maximum outdoor temperature when heat production is permitted. If HEAT STOP applies, the outdoor temperature must drop 3°C below the setting before HEAT STOP stops.	17°C (interval: OFF, 0°C / 40°C)
REDUCTION	Only appears if the tariff control function has been activated. Lowering set room temperature. Active at 10 kohm connection at EVU input.	2°C (interval: 1°C / 10°C)
ROOM FACTOR	Determines how large an impact the room temperature is to have when calculating the supply temperature.	2 (interval: 0 / 4) (0 = no impact, 4 = large impact)
POOL (Expansion card)	Only appears if POOL is selected. The temperature in the pool is controlled by a separate sensor regardless of the heating and hot water system.	20°C (interval: OFF, 5°C / 40°C)
POOL HYSTERESIS (Expansion card)	Only appears if POOL is selected. In simple terms, the POOL HYSTERESIS is the temperature interval between start and stop for pool heating. If the difference between the actual supply temperature to pool and the calculated supply temperature is too great, either the integral value is set to start value A1 (the heat pump starts) or the value is set to 0 (stops the heat pump).	2°C (interval: 1°C / 10°C)

Sub menu INFORMATION -> HEAT CURVE 2

The menu only applies if the expansion card is installed and only appears if shunt group sensor is connected and activated in menu SERVICE -> INSTALLATION -> SYSTEM -> SHUNTGROUPE (Expansion card). Used to change settings for heat curve 2.

Menu selection	Meaning	Factory setting
CURVE 2	Calculated shunt group temperature at 0°C outdoor temperature. Shown as a graph that also shows MIN and MAX values.	40°C (interval: 22°C / 56°C)
MIN	Minimum permitted shunt group temperature, if the temperature for heat stop has not been reached.	10°C (interval: 10°C / 50°C)
MAX	Maximum permitted shunt group temperature.	55°C (interval: 15°C / 70°C)

Sub menu INFORMATION -> TEMPERATURE

Used to indicate the prevailing temperatures, history and set/calculated values. History can be accessed to view all the values by pressing the right arrow to present a graph of the last 100 measurement points for the set time interval (SERVICE -> INSTALLATION -> LOGTIME). In the event of an alarm, history stops being logged until the alarm is reset by changing the operating mode to OFF.

Menu selection	Meaning	Factory setting
OUTDOOR	Shows the actual outdoor temperature.	-
ROOM	Shows the actual set temperature.	-
SUPPLY PIPE	Shows the actual supply temperature. The calculated supply temperature to the heating system group is within brackets. During hot water production in operating mode ADD.HEAT the value for HOT WATER STOPP + 5° is shown within brackets.	-
RETURN PIPE	Shows the actual return temperature. The stop temperature, MAX RETURN is within brackets.	-
HOT WATER	Shows the actual hot water temperature.	-
INTEGRAL	Shows the actual calculated value for integral.	-
BRINE OUT	Shows the actual temperature for the brine system's supply pipe.	-
BRINE IN	Shows the actual temperature for the brine system's return pipe.	-
POOL (Expansion card)	Only appears if POOL is selected. Shows the actual pool temperature. The set pool temperature is shown in brackets.	-
SHUNTGROU (Expansion card)	Only appears if SHUNTGROU is selected. Shows the actual supply temperature. The calculated supply temperature to the shunt group is within brackets.	-
COOLING (Expansion card)	Only appears if COOLING is selected. Shows the actual supply temperature. The set point value is shown in brackets.	-
CURRENT (Expansion card)	Only appears if CURRENT LIMITER is selected. Shows the actual current consumption. The set value for MAX CURRENT is shown between brackets.	-

Sub menu INFORMATION -> OPERAT. TIME

Used to show the operating time for each component. Time given in hours.

Menu selection	Meaning	Factory setting
HEATPUMP	Compressor operating time for both heating and hot water production.	-
ADD. HEAT 1	Operating time auxiliary heater power stage 1 with full output 3 kW (VL).	-
ADD. HEAT 2	Operating time auxiliary heater power stage 2 with full output 6 kW (VL).	-
ADD. HEAT 3	Operating time auxiliary heater power stage 3 with full output 6 kW (VL).	-
HOT WATER	Operating time hot water with compressor.	-
COOLING (Expansion card)	Operating time passive cooling.	-
COOLING ACTIVE (Expansion card)	Operating time active cooling.	-

Sub menu INFORMATION -> DEFROST

Used to obtain information about outdoor unit defrosting and to make certain settings.

Menu selection	Meaning	Factory setting
DEFROSTS	Total number of defrosts carried out.	-
BETW. 2 DEFR	The operating time of the compressor in minutes between the 2 last defrosts.	-
TIME SINCE DEFROST	The operating time of the compressor in minutes since last defrost.	-
FAN H OFF AT	Fan high speed is deactivated at this temperature and low speed is activated.	12°C (interval: 10°C / 20°C)
DEFROST CURVE	Here, the angle of the defrost curve can be changed using the right-hand arrow and by either pressing + or - (Change the start temperature for defrost).	-10°C (interval: -13°C / -7°C)
MANUEL DEFR	By using the right-hand arrow + or -, defrost can be started manually (shunts +20°C for 10 minutes).	0 (interval: 0 / 1)

13.2 Main menu SERVICE

This menu is for use during installation and service to optimise and adjust the operation of the heat pump. Access the menu by holding the left and right arrows in for 3 seconds. The sub menus available in the SERVICE menu are shown in the following table:

Main menu	Sub menu	Selection/settings	
SERVICE			
	HOT WATER		
		START HOT WATER TIME HEATING TIME TOPH.INTERVAL TOPH.STOP	
	HEATPUMP		
		INTEGRAL A1 HYSTERESIS MAX RETURN STARTINTERVAL ALARM BRINE PRESSURE PIPE OUTDOOR STOP SHUNT COOLING	
	ADD. HEAT		
		INTEGRAL A2 HYSTERESIS MAXSTEP MAX CURRENT SHUNTTIME HOT WATER STOP	
	MANUAL TEST		
		MANUAL TEST HEATPUMP BRINEPUMP CIRC.PUMP VXV HOT WATER SHUNT 1 ADD. HEAT 1 ADD. HEAT 2 ADD. HEAT 3 SHUNT DEFR FAN L FAN H ADD.HEAT EXT ALARM SHUNT COOLING SHUNTGROU COOLING PASSIVE COOLING A VXV POOL	
	INSTALLATION		
		SWEDISH	
		SYSTEM	
			HEAT SOURCE HEATING SYSTEM COOLING POOL SHUNTGROU ADD. HEAT
		SERVICETIME FACTORY SET RESET OPERAT. TIME CALIBRATION SENSOR LOGTIME BRINETIME ON BRINETIME OFF TOPH.TIME TOPH.TIME D	
	DEFROST		
		DEFR CURVE 0 DEFR CURVE -XX DEFR TEMPERATURE STOP DEFR BELOW 5°C DEFROST MIN TIME DEFROST DEFROST SENSOR	

Sub menu SERVICE -> HOT WATER

Used to change the settings for hot water production.

Menu selection	Meaning	Factory setting
START	Start temperature for hot water production. Shows the actual hot water temperature and the value within brackets indicates the start temperature.	40°C (at OUTSIDE AIR temperature of 38°C) (interval: 30°C / 55°C)
HOT WATER TIME	Time for hot water production during combined hot water and heating demand, in minutes.	40M (up to 8kW) 20M (10kW and more) (interval: 5M / 40M)
HEATING TIME	Time for hot water production during combined heating and hot water demand, in minutes.	20M (interval: 5M / 40M)
TOPH. INTERVAL	Time interval between peak heating charging, legionella function, in days.	7D (interval: OFF, 1D / 90D)
TOPH. STOP	Stop temperature for peak heating charging (applies to system VL).	60°C (interval: 50°C / 65°C)

Sub menu SERVICE -> HEATPUMP

Used to change the heat pump's operating settings.

Menu selection	Meaning	Factory setting
INTEGRAL A1	The integral's value for starting the heat pump. See the "Heat pump" section for more information about Integral and Hysteresis.	60 (interval: 5 / 300)
HYSTERESIS	If the difference between the actual supply temperature and the calculated supply temperature is too great either the integral value is set to start value A1 (the heat pump starts) or the value is set to 0 (stops the heat pump).	10°C (at OUTSIDE AIR temperature of 12°C) (interval: 1°C / 15°C)
MAX RETURN	Stop temperature at high return from the heating system.	55°C (interval: 30°C / 70°C)
STARTINTERVAL	Minimum time interval between two heat pump starts in minutes.	20M (interval: 10M / 30M)
PRESSURE PIPE	Sensor on the compressor's hot gas line. Value within brackets indicates maximum permitted temperature. If this value is exceeded, the compressor will stop and start again as soon as the temperature has dropped. No alarm shown in the display, however, a square is shown in the left, lower corner of the display.	130°C (interval: 100°C / 160°C)
OUTDOOR STOP	Lowest outdoor temperature when the outdoor sensor stops the compressor and heating or hot water instead produce with auxiliary heater.	-20°C (interval: -20°C / -1°C)
SHUNT COOLING (Expansion card)	Set point value for cooling. Desired temperature for supply pipe.	18°C (interval: 0°C / 30°C)

Sub menu SERVICE -> ADD. HEAT

Used to change the heat pump stage's operating settings.

Menu selection	Meaning	Factory setting
INTEGRAL A2	Two conditions must be fulfilled in order to start the auxiliary heater: the integral's value to start must be less than integral A1 + A2, and the supply temperature must be 2° lower than the calculated temperature. See figure 6 for further information.	600 (interval: 50 / 990)
HYSTERESIS	If the difference between the actual supply temperature and the calculated supply temperature is too great (see figure 7), either the integral value is set to start value A1 + A2 (the auxiliary heater starts) or the value is set to 0 (stops the auxiliary heater).	20°C (interval: 5°C / 30°C)
MAXSTEP	Maximum number of permitted steps for auxiliary heating. 0 = no auxiliary heating permitted (Means that only AUTO or OFF can be selected.)	2 (at OUTSIDE AIR 5) (interval: OFF, 1 / 3) (interval at OUTSIDE AIR: OFF, 1 / 5)
MAX CURRENT (Expansion card)	Refers to main fuse in the unit, in amperes.	20 (interval: 16 / 35)
SHUNT TIME	Minimum time interval between signals to shunt motor to affect the supply temperature, in seconds. Applies to all connected shunt groups (applies to system D or VLD).	60S (interval: 10S / 99S)
HOT WATER STOP	Stop temperature for hot water during ADD. HEAT operation (applies to the VL system).	60°C (interval: 50°C / 65°C)

Sub menu SERVICE -> MANUAL TEST

Used to manually test and test operate the heat pump's components or signal outputs.

Menu selection	Meaning	Factory setting
MANUAL TEST	Setting options for manual test. 0 = deactivate manual test 1 = activate manual test 2 = activate manual test with option of navigating from the SERVICE menu to check that the temperatures rise.	-
HEATPUMP	0 = stop heat pump, does not stop started brine pump 1 = start heat pump, also starts brine pump. NOTE! The heat pump cannot be started in the event of an active alarm.	-
BRINEPUMP	0 = stop brine pump 1 = start brine pump	-
CIRC: PUMP	0 = stop circulation pump 1 = start circulation pump	-
VXV HOT WATER	0 = heating mode for 3-way valve 1 = hot water mode for 3-way valve	-
SHUNT 1	- = closes shunt (applies to D-system) 0 = shunt unaffected + = opens shunt (applies to D-system)	-
ADD. HEAT 1	0 = stop auxiliary heat step 1 1 = start auxiliary heat step 1	-
ADD. HEAT 2	0 = stop auxiliary heat step 2 1 = start auxiliary heat step 2	-
ADD. HEAT 3	0 = stop auxiliary heat step 2 1 = start auxiliary heat step 3	-
SHUNT DEFR	- = opens flow from the defrost tank 0 = shunt unaffected + = closes the flow from the defrost tank	-
FAN L	0 = stop fan 1 = start fan with low speed	-
FAN H	0 = stop fan 1 = start fan with high speed	-
ADD.HEAT EXT	0 = 0V on terminal block 283 1 = control voltage 230V on terminal block 283	-
ALARM (Expansion card)	0 = stop signal on output External alarm 1 = start signal on output External alarm	-
SHUNT COOLING (Expansion card)	- = shuts shunt 0 = shunt unaffected + = opens shunt	-
SHUNTGROU (Expansion card)	- = shuts shunt 0 = shunt unaffected + = opens shunt	-
COOLING PASSIVE (Expansion card)	0 = stop passive cooling 1 = start passive cooling (brine pump starts and shunt cooling regulates to set point value)	-
COOLING ACTIVE (Expansion card)	0 = stop active cooling 1 = start active cooling (brine pump and compressor starts, shunt cooling regulates to set point value)	-
VXV POOL (Expansion card)	0 = normal mode for exchange valve 1 = pool mode for exchange valve	-

Sub menu SERVICE -> INSTALLATION

Used for settings that are set during installation

Menu selection	Meaning	Factory setting														
SWEDISH	Language setting for the control computer.	SWEDISH (SVENSKA NORSK, SUOMI, DEUTSCH, NEDERLANDS, ENGLISH, FRANCAIS POLSKI DANSK)														
SYSTEM NOTE! The menu selection in the SYSTEM menu varies depending on the selected values. Tip: start in the top menu and work downwards.	Sub menu SERVICE -> INSTALLATION -> SYSTEM:															
	<table><tr><th>Menu selection</th><th>Meaning</th></tr><tr><td>HEAT SOURCE</td><td>OUTSIDE AIR</td></tr><tr><td>HEATING SYSTEM</td><td>VLD SYSTEM</td></tr><tr><td>COOLING (Expansion card)</td><td>COOLING PASSIVE: OFF/EXTERNAL/INTEGRATED IN HP COOLING ACTIVE: OFF/EXTERNAL ROOM SENSOR: 0/1 (Appears if room sensor is installed)(0=controls to a constant value, 1=controls to the value that the room sensor has)</td></tr><tr><td>POOL (Expansion card)</td><td>ON/OFF</td></tr><tr><td>SHUNTGROUP (Expansion card)</td><td>ON/OFF When ON, HEAT CURVE 2 is activated in the INFORMATION menu.</td></tr><tr><td>ADD. HEAT</td><td>CONTROLLED CP: only OFF 0-10V: OFF / EXTERNAL ADDITIONAL HEATER (Expansion card) FLOW SENSOR: ON/OFF CURRENT LIMITER: ON/OFF(Expansion card) PHASE FAULT: OFF / PHASE READING</td></tr></table>	Menu selection	Meaning	HEAT SOURCE	OUTSIDE AIR	HEATING SYSTEM	VLD SYSTEM	COOLING (Expansion card)	COOLING PASSIVE: OFF/EXTERNAL/INTEGRATED IN HP COOLING ACTIVE: OFF/EXTERNAL ROOM SENSOR: 0/1 (Appears if room sensor is installed)(0=controls to a constant value, 1=controls to the value that the room sensor has)	POOL (Expansion card)	ON/OFF	SHUNTGROUP (Expansion card)	ON/OFF When ON, HEAT CURVE 2 is activated in the INFORMATION menu.	ADD. HEAT	CONTROLLED CP: only OFF 0-10V: OFF / EXTERNAL ADDITIONAL HEATER (Expansion card) FLOW SENSOR: ON/OFF CURRENT LIMITER: ON/OFF(Expansion card) PHASE FAULT: OFF / PHASE READING	
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HEATING SYSTEM	VLD SYSTEM															
COOLING (Expansion card)	COOLING PASSIVE: OFF/EXTERNAL/INTEGRATED IN HP COOLING ACTIVE: OFF/EXTERNAL ROOM SENSOR: 0/1 (Appears if room sensor is installed)(0=controls to a constant value, 1=controls to the value that the room sensor has)															
POOL (Expansion card)	ON/OFF															
SHUNTGROUP (Expansion card)	ON/OFF When ON, HEAT CURVE 2 is activated in the INFORMATION menu.															
ADD. HEAT	CONTROLLED CP: only OFF 0-10V: OFF / EXTERNAL ADDITIONAL HEATER (Expansion card) FLOW SENSOR: ON/OFF CURRENT LIMITER: ON/OFF(Expansion card) PHASE FAULT: OFF / PHASE READING															
SERVICETIME	NOTE! Only used for test operation. Simulates time 60 times as fast, which means that the waiting times are eliminated during test operation. 0 = deactivates SERVICETIME 1 = activates SERVICETIME which speeds up the control computer's integral calculation and start delay by 60 times.	-														
FACTORY SET	0 = starting point, the value returns to zero after a change R = reset factory settings for radiator system G = reset factory settings for under floor heating	-														
RESET OPERAT. TIME	0 = no reset of operation times 1 = reset operation times to zero	-														
CALIBRATION SENSOR	Following sensors are in the installation: OUTDOOR SUPPLY PIPE RETURN PIPE HOT WATER BRINE OUT BRINE IN DEFR SENSOR EXTERNAL INFLUENCE (these parameters affect all sensors except the outdoor sensor. The parameter compensates for the external influence on the sensor that is mounted in the heat pump.	0 (interval: -5°C / 5°C) 0 (interval: -5°C / 5°C) 0 (interval: -5°C / 5°C) 0 (interval: -5°C / 5°C) 0 (interval: -5°C / 5°C) 0 (interval: -5°C / 5°C) 0 (interval: -5°C / 5°C) 0 (at OUTSIDE AIR 5) (interval: 0 / 20)														
LOGTIME	Time interval between collection points of temperature history in minutes. The history graphs always show the 60 last collection points, which means that the graphs can display history from 1 hour up to 60 hours ago. (The function is not active if there is an active alarm).	1M (interval: 1M / 60M)														
BRINETIME ON	Switch on delay for compressor, in seconds.	30S (interval: 10S / 90S)														
BRINETIME OFF	Switch off delay for brine pump, in seconds.	30S (interval: 10S / 60S)														
TOPH. TIME	OFF = Deactivates time period for peak heating charging (applies to system D). ON = Activates time period for peak heating charging (applies to system D).	OFF														

Sub menu SERVICE -> DEFROST

Used to change settings for outdoor unit defrost.

Menu selection	Meaning	Factory setting
DEFR CURVE 0	Here, the angle of the defrost curve, starting at an outdoor temperature of 0°C, can be changed using the right-hand arrow and by either pressing + or – (changes the start temperature for defrosting).	-10°C (interval: -15°C / -5°C)
DEFR CURVE -20	Here, the angle of the defrost curve, starting at an outdoor temperature of -20°C, can be changed using the right-hand arrow and by either pressing + or – (changes the start temperature for defrosting).	EXTERIOR STOP -4°C (interval: EXTERIOR STOP -8°C / EXTERIOR STOP -1°C)
DEFR TEMPERATURE	The temperature shunted to the outdoor unit during a defrost.	15°C (interval: 14°C / 20°C)
STOP DEFR	The temperature that must be reached in the Brine In sensor to complete a defrost.	11°C (interval: 7°C / 12°C)
UNDER 5°C DEFR	Safety defrosting occurs when the outdoor temperature has been below 5° for a set number of days, shunts +20°C for 10 minutes.	7D (interval: OFF, 1D / 14D)
MIN TIME DEFROST	Minimum time between two defrosts in minutes.	45M (interval: 10M / 60M)
DEFR SENSOR	Shows the current air temperature that has passed the outdoor unit.	-

14 Troubleshooting

 **NOTE!** This troubleshooting section contains general heat pump information for the whole range and can therefore contain certain points that do not apply to the installed heat pump.

14.1 Alarm list

Shown in display in the event of an alarm. To reset alarms 1-5, set the operating mode to OFF or cut the power supply.

Message	Meaning
HIGHPRESS ERROR	Tripped high pressure switch. Compressor stopped. No hot water production.
LOWPRESS ERROR	Tripped low pressure switch. Compressor stopped. No hot water production.
MOTOR P ERROR	Deployed motor protection (Over current relay compressor). Compressor stopped. No hot water production.
BRINE OUT	Brine supply does not exceed set temperature. Compressor stopped. No hot water production. Not normally activated.
BRINEFLOW LOW	Flow sensor not active during last start. Compressor stopped. No hot water production.
ADD. HEAT	Overheating protection deployed. No auxiliary heating active.
SENSOR OUTDOOR	Fault in outside sensor. Zero degrees used for calculations.
SENSOR FRONT	Incorrect supply pipe sensor. Everything stops except circulation pump.
SENSOR RETURN	Return sensor fault. Return temperature = Supply pipe – 5 is used. Calculated supply temperature limited to maximum 45°C.
SENSOR HOT WATER	Fault on sensor for start temperature. No hot water production.
SENSOR DEFROST	Defrost sensor fault. Heat and hot water production is controlled from the outdoor sensor's value instead.
MS FAN	Deployed motor protection for outdoor unit fan. Compressor stopped. No hot water production.
SENSOR COOLING	Sensor fault. Cooling function stops.

14.2 Measurement points

Conversion table for sensors

NOTE! When reading the resistance of the sensors, the sensor leads must first be disconnected from the control equipment.

Outdoor sensor	
°C	kohm
-30	1884
-25	1443
-20	1115
-15	868
-10	681
-5	538
0	428
5	343
10	276
15	224
20	183
25	150
30	124
35	103
40	86

Other sensors	
°C	kohm
0	66.3
5	52.4
10	41.8
15	33.5
20	27.1
25	22.0
30	18.0
35	14.8
40	12.2
45	10.1
50	8.5
55	7.1
60	6.0
65	5.0
70	4.2
75	3.7
80	3.1
85	2.7
90	2.3
95	2.0

1. First measure the sensor including the cable.
2. Then measure the sensor only.

14.3 Operational problems – Alarm

Problem – Alarm LP (low pressure pressure switch)

Cause	Troubleshooting	Remedy
1. Blocked strainer on the brine circuit.	Check that the strainer is not blocked.	Clean the strainer if necessary.
2. Air in the brine circuit.	Listen for air in the heat pump and brine circuit.	Bleed the brine circuit according to the installation instructions.
3. Closed taps, main tap or filler cock on the brine circuit.	Check that the shut-off cock/any other taps are open.	Open closed taps.
4. The circulation pump for the brine circuit is defective or has jammed.	Check: • That the circulation pump spins. • That the shut-off valves are open. • That the strainer is not blocked. • That no air is in the heating system.	The circulation pump may have jammed, if so, open the bleed screw and try to release the paddle wheel using a screwdriver for example. Open closed valves or taps. Check, and, if necessary, clean the strainer. If necessary, bleed the heating system according to the installation instructions
5. Cable break or loose cable to low pressure pressure switch.	• Check that both cables are connected on the pressure switch. • Using the buzzer, check that there are no cable breaks. In order to do this, disconnect the cables from the pressure switch and circuit board.	If a cable has come loose, connect it. If there is a cable break, replace the cable.
6. Low pressure pressure switch opens too soon.	• Incorrect pressure switch installed. Higher break pressure than intended. See marking. • Pressure switch fault, opens at a higher pressure than indicated (mark pressure). Check using the manometer apparatus. • Defective pressure switch, always open.	If the low pressure pressure switch opens too soon or is always open, replace it.
7. Incorrect type of anti-freeze, must be in accordance with instructions.	Check that the correct type of anti-freeze is used.	If the incorrect type of anti-freeze is used, the entire system must be drained and refilled with a new mixture.
8. Incorrect mix of anti-freeze, the concentration must be in accordance with instructions.	Check the freezing point of the mix using a refractometer.	If the mixture is not in accordance with the instructions, it must be remixed in an external container. This is because the fluids do not mix with each other well if one is filled directly into the system.
9. Short active collector, e.g. short or dry bore hole, short surface soil collector.	• Check the length of the collector that is being used and compare with the collector length in the dimensioning documentation. • In addition, check that the collector is not suspended "in free air" if boreholes are used.	If the active collector is too short, the heat pump cannot receive enough energy from the heat source, which results in it requiring an addition to cover the energy requirement.
10. Collector too long, pressure drop too great.	Check the length of the collector that is being used and that it is connected in parallel (not connected in series) if more than 1 coil is being used.	If a longer collector is being used than recommended for the specific heat pump, it must be divided on several parallel connected coils.
11. Expansion valve defective or incorrectly set.	Using manometer apparatus and thermometer check what the overheating reading of the unit is. Also check that bulb and capillary tube are undamaged and that the bulb is correctly installed.	If the overheating reading does not correspond with the instructions for the specific refrigerant, adjust the expansion valve until the correct value is obtained. See separate instructions for cooling techniques. If overheating cannot be adjusted with the expansion valve or if the capillary tube/bulb is damaged, replace it.
12. Lack of refrigerant, not enough refrigerant in the system.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant. Then check in the same way that the unit's cooling is correct. See separate instructions for cooling techniques.	If cooling is not at the correct level compared with the specific refrigerant and is too low, there is insufficient refrigerant in the unit. Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant. If there appears to be a leak in the refrigerant circuit, carry out leak tracing and any necessary corrective action.

Cause	Troubleshooting	Remedy
13. Drying filter blockage.	Check the temperature difference above the drying filter. A one degree difference is permissible. If the difference is greater than 1 degree, the filter is blocked. Take a reading during operation.	If the drying filter is sealed, replace it.
14. Blocked evaporator on the water side.	If there is no strainer in the brine circuit, there is a risk of dirt sticking in the evaporator and blocking it. Unfortunately there is no easy way of checking if the evaporator is blocked. You can carry out a test by allowing the compressor and circulation pumps to remain in operation. Check that the circulation pumps work (for circ. pumps with a venting screw, unscrew it and feel if the pump rotor rotates using a screwdriver). Then read the temperature on both connection pipes to the evaporator: If the temperature difference is $<1^{\circ}\text{C}$, the evaporator is probably blocked. If the temperature difference is $2-6^{\circ}\text{C}$, it is probably not blocked. If the temperature difference is $>6^{\circ}\text{C}$, the evaporator is probably blocked.	If the evaporator is thought to be blocked, try flushing it. If this does not work, it must be replaced
15. Blocked evaporator on the refrigerant side.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant. Then check in the same way that the unit's cooling is correct. See separate instructions for cooling techniques.	If the evaporator is thought to be blocked by oil for example, try blowing nitrogen through it to release the oil. If this does not work, it must be replaced

Problem – Alarm HP (high pressure pressure switch)

Cause	Troubleshooting	Remedy
1. Blocked strainer in the heating system.	Check that the strainer is not blocked.	Clean the strainer if necessary.
2. Air in the heating system.	Listen for air in the heat pump and heating system.	Bleed the heating system circuit according to the installation instructions.
3. Closed or partially closed thermostats/valves in the heating system.	Check that the thermostats/valves in the heating system are open.	Open closed thermostats/valves.
4. The circulation pump that is defective or has jammed.	Is there voltage to the circulation pump?	In the control computer's manual test menu check that the circulation pump is active. Check if there is voltage to the circulation pump, if there is, and it does not run, the circulation pump is jammed. If this is the case, open the bleed screw and try to release the paddle wheel using a screwdriver for example. If there is no voltage to the circulation pump, check if there is voltage from the control computer, see wiring diagram. If there is voltage from the control computer, check the components between the control computer and circulation pump. If a component is defective, replace it.
5. Shut-off main tap in heating system.	Check that the main tap is open.	Open closed main tap.
6. Cable break or loose cable to high pressure pressure switch.	• Check that both cables are connected on the pressure switch. • Using the buzzer, check that there are no cable breaks. In order to do this, disconnect the cables from the pressure switch and circuit board.	If a cable has come loose, connect it. If there is a cable break, replace the cable.

Cause	Troubleshooting	Remedy
7. The operating pressure switch does not open.	• Incorrect pressure switch installed. Same or higher break pressure than high pressure pressure switch. See marking. • Pressure switch fault, opens at a higher pressure than indicated (mark pressure). Check using the manometer apparatus. • Defective pressure switch, never opens.	If the operating pressure switch does not open, replace it.
8. The high pressure pressure switch opens too soon.	• Incorrect pressure switch installed. As low or lower break pressure than operating pressure switch. See marking. • Pressure switch fault, opens at a lower pressure than indicated (mark pressure). Check using the manometer apparatus. • Defective pressure switch, always open.	If the high pressure pressure switch opens too soon or is always open, replace it.
9. External system shunt that closes on time setting.	Check for shunts or valves in the system, which are timer-controlled, that close down the entire or too large a part of the heating system.	Always ensure that there is a sufficiently large water volume for the heat pump to work against, i.e. for the heat to give off its heat to.
10. Incorrectly facing non-return valve with too high opening pressure.	• Check the system's direction of flow and that the non-return valve is turned the correct way. • Check that the heat pump's external available pressure exceeds the non-return valve's opening pressure.	If the non-return valve is facing the wrong way, turn it. If the non-return valve has too great an opening pressure, replace it.
11. Large pressure drop in the heating system.	• Dirt in the heating system. • Closed or partially closed thermostats/valves in the heating system. • Under dimensioned pipe system. Check that the HP's external available pressure exceeds the system pressure drop.	If necessary, clean/flush the heating system. Open closed thermostats/valves. If there is not sufficient pressure equipment, the heating system can be adjusted according to the system solution for large pressure drop.
12. Overfilled refrigerant circuit.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant. Then check in the same way that the unit's cooling is correct. See separate instructions for cooling techniques.	If cooling is not at the correct level compared with the specific refrigerant and is too high, there is too much refrigerant. Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant. If there appears to be a leak in the refrigerant circuit, carry out leak tracing and any necessary corrective action.
13. Blocked condenser on the water side.	If there is no strainer in the heating system, there is a risk of dirt sticking in the condenser and blocking it. Unfortunately there is no easy way of checking if the condenser is blocked. You can carry out a test by allowing the compressor and circulation pumps to remain in operation and after a while, check that the delivery pipe becomes hot and that the circulation pumps work (for circ.pumps with a venting screw, unscrew it and feel if the pump rotor rotates using a screwdriver). Then read the temperature on both connection pipes to the condenser: If the temperature difference is $<3^{\circ}\text{C}$, the condenser is probably blocked. If the temperature difference is $3\text{-}13^{\circ}\text{C}$, it is probably not blocked. If the temperature difference is $>13^{\circ}\text{C}$, the condenser is probably blocked.	If the condenser is thought to be blocked, try flushing it. If this does not work, it must be replaced
14. Blocked condenser on the refrigerant side.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant. Then check in the same way that the unit's cooling is correct. See separate instructions for cooling techniques.	If the condenser is thought to be blocked by oil for example, try blowing nitrogen through it to release the oil. If this does not work, it must be replaced

Problem – Alarm MS (motor protection)

Cause	Troubleshooting	Remedy
1. Phase drop or blown fuse.	Check that all phases are present on the terminal block for incoming supply. If not, check the fuses in the cabinet. Also check that all wiring is secure, if screw terminals are used they must be properly tightened, if phoenix flat spring terminals are used, the cables must be secure in the correct hole with load on the cable.	If any of the phases are not present, check backwards towards the building's main electrical cabinet. If there are no phases there, contact the network supplier.
2. Defective soft-starter.	Measurement check and establish that when the control computer gives a signal (there must be voltage between A1 & A2 on the soft-starter), the soft-starter releases all three phases down to the compressor.	If the soft-starter does not release the phases when it receives signals from the control computer, replace it.
3. Defective contactor.	Measurement check and establish that when the control computer gives a signal (there must be voltage between A1 & A2 on the contactor), the contactor releases all three phases down to the compressor.	If the contactor does not release the phases when it receives signals from the control computer, replace it.
4. Defective or incorrectly set motor protection.	Use a hook-on meter to establish when the motor protection deploys, check what the motor protection is set to. Compare with the table.	If the motor protection is defective, replace it. If incorrectly set, adjust to the correct value.
5. Cable break.	Check the supply to the motor protection// soft-starter/compressor.	If a cable is damaged, replace it.
6. Defective compressor.	Measurement check the three phases (each to zero) at the compressor. Deviations from the average of the three values must not be more than 12% on any of the phases. If measurement checking the winding's impedance the same value must be on all three windings.	If the compressor is defective, replace it.

Problem – Alarm sensor (all)

Cause	Troubleshooting	Remedy
Sensor fault alternatively cable fault.	- When reading the resistance of the sensors, the sensor leads must first be disconnected from the control equipment or terminal block. - First take a reading from the sensor including cable and check against the ohm table in the "Measurement points" section. - If the read off value does not correspond with the table, only measure the sensor and check the ohm table in the "Measurement points" section.	If the sensor gives a correct value, the cable is defective. If the sensor does not give a correct value, the sensor is defective.

Problem – Incorrect phase sequence

Cause	Troubleshooting	Remedy
The incoming phases have the incorrect sequence (only applies to 3-phase heat pumps).	• If the text ERR PHASE SEQ appears in the display when the heat pump is powered, (only appears in the first 10 minutes) this means that the phases have the incorrect sequence. • When the compressor is running, check the delivery pipe temperature by feeling the delivery pipe that should be hot (not just warm) even a little distance from the compressor if the phases are correctly sequenced. • When the compressor runs with the phases incorrectly sequenced a strange noise may be heard (loud, rattling) when the compressor runs backwards.	If the phases are in the incorrect order, switch two incoming phases at the main terminal block and recheck according to the troubleshooting window.

Problem – Alarm TS (addition)

Cause	Troubleshooting	Remedy
1. The overheating protection has tripped.	Check if the overheating protection has tripped.	If the overheating protection has tripped, reset it.
2. Phase drop. The alarm occurs when 230 V is not registered between incoming L2 on the circuit board and zero on block 220.	• Check if the overheating protection has tripped. • Check if any cables at the circuit board or overheating protection are loose or damaged.	If the overheating protection has tripped, reset it. If the cables are loose/damaged, secure or replace them.
3. Overheating protection fault, cannot be reset.	Press the reset button, measurement check for 230 V on the incoming and outgoing connections.	If the overheating protection is defective, replace it.
4. Flow sensor fault.	Check what the flow sensor shows, is it a plausible/actual value? Measure the resistance of the sensor, check against the ohm table in the "Measurement points" section.	If the sensor is defective, replace it.
5. No or insufficient circulation in the heating system.	Check: • That the circulation pump spins. • That the shut-off valves are open. • That the strainer is not blocked. • That no air is in the heating system.	The circulation pump may have jammed, if so, open the bleed screw and try to release the paddle wheel using a screwdriver for example. Open closed valves or taps. Check, and, if necessary, clean the strainer. If necessary, bleed the heating system according to the installation instructions.
6. The submersible tube in the electric heating element is against the coils.	Check what the flow temperature is when the overheating protection trips. It normally trips at about 95°C.	The submersible tube can be prised out slightly from the coils using a screwdriver or similar. The submersible tube must be vertical.

Problem – Alarm Brine out

Cause	Troubleshooting	Remedy
1. Defective sensor.	Check what the sensor shows, is it a plausible/actual value? Measure the resistance of the sensor, check against the ohm table in the "Measurement points" section.	If the sensor is defective, replace it.
2. Brine temperature too low.	Check the set value on ALARM BRINE in the heat pump's control computer.	The alarm is triggered when the temperature on BRINE OUT is as low or lower than the set value on ALARM BRINE. In the factory setting this function is inactive.

Problem – Alarm Brine flow low

Cause	Troubleshooting	Remedy
1. Incorrect system selected in the control computer. If the system does not contain a flow switch but the control computer is set for the system with flow switch, this alarm occurs.	In the menu SYSTEM, check which is selected.	If the incorrect system is selected, change it.
2. Insufficient flow.	• Check whether the ground water pump is running? • Check the flow switch. • Calibration/setting the flow switch. • Blocked exchanger?	The ground water pump must start and run together with the heat pump's integrated brine pump. Check against the wiring diagram that the flow switch is correctly connected. Check that the flow switch is set for the correct working range according to the flow switch instructions. If the exchanger is blocked, clean or replace it.

Problem – Operating pressure switch open alternatively high hot gas temperature (indicated in the display's lower left-hand corner)

Cause	Troubleshooting	Remedy
1. The operating pressure switch does not close again.	1. Switch off the main switch for the heat pump, wait until the compressor has been stationary for at least 15 minutes. 2. Disconnect the two cables on the pressure switch, using a buzzer check if the pressure switch is closed.	If the pressure switch is closed, bridge the pressure switch cables temporarily and switch on the current to the heat pump again. If there is an indication  in the display this means that the pressure switch is fault-free and the problem is in the wiring or in the circuit board. If the pressure switch is open, try carefully tapping the head of the pressure switch with a screwdriver and using the buzzer test to see if it has closed again. Replace the pressure switch if it appears to jam repeatedly.
2. Sensor fault, shows >120°C	Check what the sensor shows, is it a plausible/actual value? Measure the resistance of the sensor, check against the ohm table in the "Measurement points" section.	If the sensor is defective, replace it.
3. Hot gas temperature too high.	Check the set value on DELIVERY PIPE in the heat pump's control computer (factory setting 120°C)	The symbol appears when the delivery pipe temperature is as high or greater than the set value for DELIVERY PIPE.
4. Overheating too high.	Using manometer apparatus and thermometer check what the overheating reading of the unit is. Also check that bulb and capillary tube are undamaged and that the bulb is correctly installed.	If the overheating reading does not correspond with the instructions for the specific refrigerant, adjust the expansion valve until the correct value is obtained. See separate instructions for cooling techniques. If overheating cannot be adjusted with the expansion valve or if the capillary tube/bulb is damaged, replace it.

Cause	Troubleshooting	Remedy
5. Lack of refrigerant, not enough refrigerant in the system.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant. Then check in the same way that the unit's cooling is correct. See separate instructions for cooling techniques.	If cooling is not at the correct level compared with the specific refrigerant and is too low, there is insufficient refrigerant in the unit. Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant. If there appears to be a leak in the refrigerant circuit, carry out leak tracing and any necessary corrective action. If leak tracer is not available, brush soap water on the suspected leak and look for bubbles. Also check for oil as this can come out from the refrigerant circuit.

14.4 Operational problem – Leakage

Problem – Leak fluid side

Cause	Troubleshooting	Remedy
1. Insufficiently tightened connections.	Locate the leak.	• Tighten the connection and check that it is sealed • If it is still not sealed, replace the entire connection and support sleeve (only at soft pipes)
2. Cracked nut or connection.	Locate the leak.	Replace nut or connection.
3. Defective gasket or O-ring.	Locate the leak.	Replace the gasket or O-ring.
4. There is no overflow pipe connected to the safety valve(s).	Establish which safety valve does not have an overflow pipe.	Install an overflow pipe according to the applicable norms.
5. Filler valve between incoming cold water and heating system not closed or leaking.	Check whether water continuously leaks from the safety valve on the expansion vessel on the hot side.	Try closing the filler valve and see if water stops dripping from the safety valve, if not, replace the filler valve.
6. No condensation drain to heat pump's drip tray.	Check that condensation drain is installed and correctly connected.	Install the condensation drain that runs out into the floor drain.
7. Lack of condensation insulation on cold water pipe and/or brine pipe.	Establish where the condensation is coming from.	The brine pipe must always be insulated. In the event of problems with condensation on the cold water pipes, insulate them. Condensation often accumulates in joints and angled sections of the insulation. Improve the insulation.
8. Leak at soldered joints.	Locate the leak.	Drain the system of fluid, repair the leak. If the leak is on the connection pipe to the heat exchanger, also drain the refrigerant side.
9. Leak at the condenser's drain cock.	1. Check that the valve is completely closed. 2. Check that the sealed cover is sealed.	If the sealed cover is not sealed, replace the sealed cover or the entire drain tap.
10. Leak at the condenser's bleed valve.	Check that it is completely closed.	If it is fully closed and still leaks, replace it.
11. Leak at soldered joint on water heater.	Locate the leak.	If there is a leak at the soldered joint, replace the water heater.
12. Associated leak on the water heater.	• Establish whether water continuously leaks from the safety valve on the expansion vessel on the hot side. • Establish whether water continuously leaks from the safety valve on the cold side.	If the water heater has a leak, replace it.
13. Associated leakage in the condenser.	• Check for lack of refrigerant in the unit. • Check by smelling by safety valve on the hot side, open the valve and check.	If the condenser has a leak, replace it.

Cause	Troubleshooting	Remedy
14. Anti-freeze is forced out of the safety valve on the expansion tank (brine system).	During the winter, water surrounding the hoses in the borehole can freeze. In some cases, the ice can push against the hoses slightly. Due to the reduction in volume in the hose, the anti-freeze fills the expansion tank and eventually forces some fluid out of the safety valve. When the ice in the borehole melts and the hose expands and returns to its original state, a vacuum is generated which results in a reduction in tank level. As the safety valve does not let any air in, the expansion tank can retract inwards due to the vacuum created.	To prevent anti-freeze from being forced out from the safety valve, you can exchange the existing expansion tank for a closed pressure expansion vessel with a greater volume. To prevent the expansion tank retracting inwards, a vacuum valve can be installed in the system.

14.5 Operational problem – Noise

Problem – Noise problem in the radiator system

Cause	Troubleshooting	Remedy
1. Flexible hoses missing.	Flexible hoses must be installed according to the instructions.	Install flexible hoses according to the instructions.
2. Incorrectly installed flexible hoses.	Flexible hoses must be installed according to the instructions.	Install flexible hoses according to the instructions.
3. Installing/suspending pipes.	Check if the mountings are too rigid, right type, right sizes and/or installed too close together.	If something seems to be incorrect according to the troubleshooting window, carry out corrective actions.
4. Clicking.	- Establish when clicking occurs, during heating and/or in connection with completed hot water production? - Locate the clicking noises.	A surge tank can be installed on the supply pipe to mix the hot water with the existing, slightly cooler, water, before it goes out to the radiators. Try lubricating lead-ins in walls, ceilings and floors with silicone spray.
5. Circulation noise (whistling noise in the heating system).	Check the heating system. - Closed valves, choke valves, adjuster valves or other restrictions in the radiator system can cause circulation noise. - Is the heating system correctly adjusted for flow? - Too great a flow in the heating system can cause circulation noise.	If the incorrect type of valve is used to choke the flow, replace with the correct type. If the heating system is not correctly adjusted, make adjustments. Can the heating system be run at a lower flow?

Problem – Loud compressor noise

Cause	Troubleshooting	Remedy
1. Phase drop. The compressor attempts to start or operates on two phases.	1. Check that there is 400 V between incoming phases on the heat pump. 2. If there is supply to the heat pump, measure the voltage for all electrical components all the way to the compressor, see wiring diagram.	Check where the phase drop is and rectify.
2. Touching pipes – vibrations.	Establish which pipe(s) is/are causing the problem.	Try to release any tensions that cause the vibrations.
3. Compressor fault.	Determine whether the compressor is unusually loud.	If the compressor is defective, replace it.

Problem – Shrieking whistling noise

Cause	Troubleshooting	Remedy
1. Whistling expansion valve.	1. Take overheating readings, adjust to the recommended value. 2. Open and close the valve fully in and out. 3. Adjust the expansion valve to recommended overheating value again.	Check if the noise has stopped, if not, continue with point 2. Continue with point 3. If the problem persists, replace the expansion valve.
2. Noise from the soft-starter.	Measurement check the input and output phases for the soft-starter as well as the control signals from the control computer, see wiring diagram.	If the soft-starter is defective, replace it.
3. The compressor's IPR valve opens.	The compressor has an integrated IPR valve that opens at 28 ± 3 bar. When the valve opens, pressure equalizes between the compressor's high and low pressure side and a milling/whistling sound is heard. To establish whether the valve opens at the correct pressure, connect a manometer on the high and low pressure side. When the valve opens, this is indicated by the pressure on the low pressure side rising and reaching the pressure on the high pressure side. Check at what pressure the valve starts to open.	If it opens at a too low pressure, replace the compressor.

Problem – Noise – miscellaneous

Cause	Troubleshooting	Remedy
1. Vibrating protective sleeves on the pressure switches.	Establish where the vibration noise is coming from.	Prevent the protection sleeve vibrating by using insulation tape for example.
2. Vibration noise from the electrical installation.	Check for electrical steps or similar devices screwed to the heat pump and wall. These can cause vibrations and noise.	Carry out according to the installation instructions.
3. The heat pump is not level.	Check that the heat pump is level by using a spirit level. Check that the heat pump is supported by all four feet	If the heat pump is not level, adjust using the feet.

14.6 Operational problem – Hot water

Problem – Temperature and/or quantity

Cause	Troubleshooting	Remedy
1. Defective 3-way valve motor.	Check the function of the 3-way valve, that it runs between the end positions by running a manual test.	If the motor is defective, replace it.
2. Jammed 3-way valve insert. The valve is not secure and releases hot water to the radiators during hot water production.	Detach the motor and test closing and opening of the valve by pressing the control arm	If the insert jams, remove and clean it, or replace it.
3. Air in TWS coil or water outer jacket.	During hot water production: • Listen for air. • Check the temperature difference between supply and return pipe.	Bleed the system. A Large temperature difference can indicate air in the system.

Cause	Troubleshooting	Remedy
4. Start temperature set too high for hot water production.	Check that the start temperature is correctly set. Should not be set above the factory set value.	• If the start value is set too high, reduce it to the factory set value. • If the system has a high (>+8°C) brine temperature, you may have to reduce the start value further for a longer running time.
5. Sensor fault, hot water sensor. Hot water production is started by the hot water sensor.	Check what the hot water sensor (the start sensor) shows, is it a plausible/actual value? Measure the resistance of the sensor, check against the ohm table in the "Measurement points" section.	If the sensor is defective, replace it.
6. Large drain flow (>12l/min).	Check how many litres of hot water (approx. 40°C) per minute drains from the tap. Use a clock and bucket to measure the drain flow.	If the drain water flow is greater than 12l/min, stratification in the water heater is affected, which reduces the hot water capacity. Suggested corrective actions: • Install a pressure reduction valve on the incoming cold water pipe. • Change to a mixer with lower flow. • Adjust the drain flow on the existing mixer, do not open the tap fully.
7. Water heater too small in relation to requirement.	How large is the requirement and what is the capacity of the heater?	Replace with a larger heater or supplement with an extra heater. E.G. supplement with an MBH TWS + Connector or an electric heater.
8. The operating pressure switch opens too soon (at too low a pressure). Hot water production ends when the operating pressure switch opens.	Check the break pressure using manometer apparatus.	If the pressure switch opens at the incorrect pressure, replace it. The replacement pressure switch can be installed on the service output (Schrader valve)
9. Insufficient exchange surface to transfer the heat pump's output to the heater. (Only applies to heat pumps with a separate heater)	Is the exchange surface too small? Can the heater cope with the heat pump's output?	Replace with a heater with a larger exchange surface.
10. Heat loss in the hot water pipe.	Open the hot water tap, read off the temperature on the outgoing hot water pipe from the heat pump and the temperature of the hot water. The temperature difference measured between the heat pump and hot water indicates the temperature loss. Examples of temperature loss causes: • Long water pipes. • Uninsulated hot water pipes. • Hot water pipes routed through cold areas. Other causes that can affect the hot water temperature: • Is a mixer valve installed in the system? Temperature set too low on the mixer valve? Leaking mixer valve? • Water tap fault? Leaking thermostat mixer?	If any problems occur during troubleshooting as per the points, carry out corrective actions. To quickly check that the heat pump's hot water production works as it should, drain the hot water so that the heat pump starts to produce the hot water. When done, read off the temperature on the top sensor and on the start sensor. The top sensor should show a temperature of around 50-55°C and the start sensor around 45-48°C. If, after completed hot water production, these temperatures are obtained, this means that you have the correct temperature and volume of hot water in the water heater.

14.7 Operational problem – Heating comfort

Problem – Too cold

Cause	Troubleshooting	Remedy
1. The heat pump's control computer is not set/adjusted to the customer's requirements/wishes.	Check the ROOM and CURVE and MAX settings.	Adjust incorrect values in the heat pump's control computer. ROOM = Desired indoor temperature CURVE = Should be set so that the desired indoor temperature (ROOM) is maintained regardless of the outdoor temperature. MAX = Highest set-point value on the supply pipe regardless of the outdoor temperature.
2. Incorrect operating mode set in the heat pump's control computer.	Check which operating mode is set.	If the incorrect operating mode is set, change to the desired operating mode.
3. Sensor fault, OUTDOOR/ROOM/SUPPLY PIPE/RETURN PIPE.	Check what the relevant sensor shows, is it a plausible/actual value? Measure the resistance of the sensor, check against the ohm table in the "Measurement points" section.	If the sensor is defective, replace it.
4. The 3-way valve has jammed in hot water mode.	1. Check the function of the 3-way valve motor by test running it manually. If the motor does not shift mode during manual test operation, check that there is voltage to the motor, see wiring diagram. 2. Detach the motor and test closing and opening of the valve by pressing the control arm.	1. Is the motor being supplied with voltage according to the wiring diagram in both operating instances? MANUAL TEST – VXV HOT WATER 0=Radiator mode, arm out from valve. 1=Hot water mode, arm positioned towards the valve. If there is voltage to the motor but the arm does not shift mode, replace it. 2. Take out and clean the jammed insert, or replace with a new insert.
5. Defective electric heating element.	Use a buzzer and check if all coils in the electric heating element are intact.	If the electric heating element is defective, replace it.
6. The heat pump has stopped on HIGH RETURN.	• Check what the MAX RETURN value is set at in the heat pump's control computer. It must be adjusted to the unit's maximum supply temperature and the system's delta temperature so that it does not cut at too high a return temperature when the highest supply temperature is transmitted. • Check what the return pipe sensor shows, is it a plausible/actual value? If not, take a resistance reading from the sensors and check against the ohm table in the "Measurement points" section.	If the MAX RETURN value is not adjusted for the system according to the troubleshooting window, adjust it. If the sensor is defective, replace it.
7. Heat production is stopped by the HYSTERESIS function.	If the flow temperature rises as soon as heat production is stopped by HYSTERESIS before INTEGRAL reaches 0, there may be heating deficit in the house. • Check if heat production stops because the hysteresis value is set too low? (See the installation instructions for factory setting.) • Check if heat production stops because thermostats/valves in the heating system are closed or partially closed? • Check if heat production stops because the heating system is under dimensioned?	• Try increasing the hysteresis value until the heat pump stops on INTEGRAL instead. • Open thermostats/valves in the heating system and check that the heat pump stops on INTEGRAL. • If the heating system is deemed to be under dimensioned, the system must be extended (increase the heat emitting surface).
8. The auxiliary heater is not permitted to cut in with sufficient output. Value set too low on MAXSTEP. MAXSTEP 1 = 3 kW MAXSTEP 2 = 6 kW MAXSTEP 3 = 9 kW MAXSTEP 4 = 12 kW MAXSTEP 5 = 15 kW	Check the set value on MAXSTEP in the heat pump's control computer.	If necessary, adjust the MAXSTEP value in the heat pump's control computer. MAXSTEP 1 = 3 kW MAXSTEP 2 = 6 kW MAXSTEP 3 = 9 kW MAXSTEP 4 = 12 kW MAXSTEP 5 = 15 kW

Cause	Troubleshooting	Remedy
9. The external auxiliary heater does not start when the heat pump's control computer requests it.	If an external auxiliary heater is used, check that it is correctly installed by test running it in MANUAL TEST – ADD.HEAT - 1. If it does not start at manual test operation, check that the start signal/voltage comes from the heat pump. See wiring diagram.	Connect the external auxiliary heater according to the instructions. Measure the voltage on the control computer's probe L2 Oil/Electricity.
10. Closed or partially closed thermostats/valves in the heating system.	Check that the thermostats/valves in the heating system are open.	Open closed thermostats/valves.
11. The total output of the heat pump and auxiliary heater is too low in relation to the building's power demand.	What is the building's power demand? What is the output of the heat pump? What is the output of the auxiliary heater, what is it set to?	Ensure that available power is at least as great as the building's power demand.
12. Under dimensioned heating system.	Check existing heating system. What output is it dimensioned for to produce at what supply temperature? What output is required to keep the room warm?	If the heating system is dimensioned for greater supply temperatures than the heat pump can provide, it must be adjusted by increasing the heat emitting surface for example. If the room requires a higher output than the heating system can provide, extend the heating system.
13. Changed conditions. Have you increased your heating and/or hot water demand?	• If the heat pump has been dimensioned for a certain demand and this demand is increased, the heat pump might not be able to maintain the desired room temperature. • If hot water consumption increases, a larger proportion of time is used to produce hot water, which means less time for heat production (only applies to VL-systems).	If the heat pump cannot cope with the demand, replace it with one with a higher output or supplement it with a higher output auxiliary heater.

Problem – Too hot

Cause	Troubleshooting	Remedy
1. The heat pump's control computer is not set/adjusted to the customer's requirements/wishes.	Check the ROOM and CURVE and MIN settings.	Adjust incorrect values in the heat pump's control computer. ROOM = Desired indoor temperature. CURVE = Should be set so that the desired indoor temperature (ROOM) is maintained regardless of the outdoor temperature. MIN = Lowest set-point value on the supply pipe regardless of the outdoor temperature.
2. Sensor fault, OUTDOOR/ROOM/SUPPLY PIPE.	Check what the relevant sensor shows, is it a plausible/actual value? Measure the resistance of the sensor, check against the ohm table in the "Measurement points" section.	If the sensor is defective, replace it.
3. Defective 3-way valve motor. The motor should set the valve to the relevant end position depending on operating conditions. If it does not, hot water from the water heater will mix with the radiator water.	Check the function of the 3-way valve motor by test running it manually. If the motor does not shift mode during manual test operation, check that there is voltage to the motor, see wiring diagram.	Is the motor being supplied with voltage according to the wiring diagram in both operating instances? MANUAL TEST – VXV HOT WATER 0=Radiator mode, arm out from valve. 1=Hot water mode, arm positioned towards the valve. If there is voltage to the motor but the arm does not shift mode, replace it.
4. Jammed 3-way valve insert. If the insert is not sealed, hot water from the water heater will mix with the radiator water.	Detach the motor and test closing and opening of the valve by pressing the control arm.	Take out and clean the jammed insert, or replace with a new insert.

Problem – irregular indoor temperature

Cause	Troubleshooting	Remedy
1. The heat pump's control computer is not set/adjusted to the customer's requirements/wishes.	Check the ROOM and CURVE, MIN, MAX CURVE5, CURVE0, CURVE-5 and HEATSTOP settings.	Adjust incorrect values in the heat pump's control computer. ROOM = Desired indoor temperature CURVE = Should be set so that the desired indoor temperature (ROOM) is maintained regardless of the outdoor temperature. MIN = Lowest set-point value on the supply pipe regardless of the outdoor temperature (on the condition that heat stop does not apply). MAX = Highest set-point value on the supply pipe regardless of the outdoor temperature. CURVE5,0,-5 = The supply temperature can be adjusted up or down 5°C at these outdoor temperatures. HEATSTOP = Stops all production of heat when the outdoor temperature is the same as or greater than the set value. To exit heat stop the outdoor temperature must drop to 3°C below the set value.
2. Incorrectly positioned/installed sensors.	Check that outdoor sensors and any room sensors are installed according to the instructions and that they are calibrated.	• Check that the room sensor is positioned in a suitable place that is representative of the building and calibrate it if necessary. Avoid placing near external doors, windows and heat sources. • Install the outdoor sensor according to the instructions and calibrate it, if necessary.

14.8 Operational problem – Miscellaneous

Problem – The heat pump runs and runs but never stops

Cause	Troubleshooting	Remedy
1. Air in the heating system.	Listen for air in the heat pump and heating system.	Bleed the heating system circuit according to the installation instructions.
2. Lack of refrigerant, not enough refrigerant in the system.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant. Then check in the same way that the unit's cooling is correct. See separate instructions for cooling techniques.	If cooling is not at the correct level compared with the specific refrigerant and is too low, there is insufficient refrigerant in the unit. Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant. If there appears to be a leak in the refrigerant circuit, carry out leak tracing and any necessary corrective action. If leak tracer is not available, brush soap water on the suspected leak and look for bubbles. Also check for oil as this can come out from the refrigerant circuit.
3. Changed conditions. Have you increased your heating and/or hot water demand?	• If the heat pump has been dimensioned for a certain demand and this demand is increased, the heat pump might not be able to maintain the desired room temperature. • If hot water consumption increases, a larger proportion of time is used to produce hot water, which means less time for heat production.	If the heat pump cannot cope with the demand, replace it with one with a higher output or supplement it with a higher output auxiliary heater.

Problem – Runs on electric heating element

Cause	Troubleshooting	Remedy
1. Operating mode ADD.HEAT is selected.	If this operating mode is selected, the auxiliary heater is used for heating and hot water production, not the compressor.	If ADD.HEAT mode is selected and you no longer want it, change to AUTO, the heat pump then controls both the compressor and auxiliary heater.
2. The compressor cannot run due to an alarm.	Check the alarm that is indicated in the display.	Rectify the problem and reset the alarm. See the "Operational problem – Alarm" section.
3. The integral value has reached the start level for the auxiliary heater.	Check what the integral value is in the control computer.	If the auxiliary heater is in operation because the integral value has counted down to the start value, the computer reacts as it should, see the "Heat pump" section for further information.
4. Peak heat operation (legionella function) is running.	Check if the heat pump runs peak heat. See the instructions for the relevant model.	Peak heat operation occurs in connection with hot water production with the set interval. The compressor should then start to produce hot water and 2 minutes later the auxiliary heater starts, the compressor should then stop and the stop temperature is reached with only the auxiliary heater connected. Take no corrective action.
5. The heat pump has stopped on HIGH RETURN.	• Check what the MAX RETURN value is set at in the heat pump's control computer. It must be adjusted to the unit's maximum supply temperature and the system's delta temperature so that it does not cut at too high a return temperature when the highest supply temperature is transmitted. • Check what the return pipe sensor shows, is it a plausible/actual value? If not, take a resistance reading from the sensors and check against the ohm table in the "Measurement points" section.	If the MAX RETURN value is not adjusted for the system according to the troubleshooting window, adjust it. If the sensor is defective, replace it.
6. The compressor runs backwards. Incoming phases are in the incorrect order. If the compressor runs backwards, it will not cope with compressing the refrigerant and therefore does not produce the correct power, which leads to the control computer requesting auxiliary heating.	• If the text ERR PHASE SEQ appears in the display when the heat pump is powered, (only appears in the first 10 minutes) this means that the phases have the incorrect sequence. • When the compressor is running, check the delivery pipe temperature by feeling the delivery pipe that should be hot (not just warm) even a little distance from the compressor if the phases are correctly sequenced. • When the compressor runs with the phases incorrectly sequenced a strange noise may be heard (loud, rattling) when the compressor runs backwards.	If the phases are in the incorrect order, switch two incoming phases at the main terminal block and recheck according to the troubleshooting window.
7. Changed conditions. Have you increased your heating and/or hot water demand?	• If the heat pump has been dimensioned for a certain demand and this demand is increased, the heat pump might not be able to maintain the desired room temperature. • If hot water consumption increases, a larger proportion of time is used to produce hot water, which means less time for heat production (only applies to VL-systems).	If the heat pump cannot cope with the demand, replace it with one with a higher output or supplement it with a higher output auxiliary heater.

Problem – The auxiliary heater is in operation but not the compressor

Cause	Troubleshooting	Remedy
1. Operating mode ADD.HEAT is selected.	If this operating mode is selected, the auxiliary heater is used for heating and hot water production, not the compressor.	If ADD.HEAT mode is selected and you no longer want it, change to AUTO, the heat pump then controls both the compressor and auxiliary heater.
2. Peak heat operation (legionella function) is running.	Check if the heat pump runs peak heat. See the instructions for the relevant model.	Peak heat operation occurs in connection with hot water production with the set interval. The compressor should then start to produce hot water and 2 minutes later the auxiliary heater starts, the compressor should then stop and the stop temperature is reached with only the auxiliary heater connected. Take no corrective action, this is normal.

Cause	Troubleshooting	Remedy
3. The compressor cannot run due to an alarm.	Check the alarm that is indicated in the display.	Rectify the problem and reset the alarm. See the "Operational problem – Alarm" section.
4. The heat pump has stopped on high return.	• Check what the MAX value is set at in the heat pump's control computer. It must be adjusted to the unit's maximum supply temperature and the system's delta temperature so that it does not cut at too high a return temperature when the highest supply temperature is transmitted. • Check what the return pipe sensor shows, is it a plausible/actual value? If not, take a resistance reading from the sensors and check against the ohm table in the "Measurement points" section.	• If the MAX RETURN value is not adjusted for the system according to the troubleshooting window, adjust it. • If the sensor is defective, replace it.
5. The compressor has been stopped by the operating pressure switch or delivery pipe sensor.	Check if a square appears in the display's lower left corner, if so, the operating pressure switch is open or the delivery pipe sensor triggers an alarm for too high temperature. • The operating pressure switch is most easily checked by using a buzzer to see if it is connected. • The delivery pipe sensor value is read off from the control computer in the HEATPUMP menu. Is it a plausible/actual value? If not, take a resistance reading from the sensor and check against the ohm table in the "Measurement points" section. • The compressor has been stopped by the delivery pipe sensor and you have established that it shows the correct temperature. This may have been caused by a leak in the refrigerant circuit.	If the operating pressure switch has stuck in the open position, try gently tapping on the pressure switch head. If this does not help, or it sticks in the open position repeatedly, replace the pressure switch. If the delivery pipe sensor is defective, replace it. If the delivery pipe temperature gets so hot that the compressor stops, start by leak-tracing the unit. Rectify the leak, if a leak is found. If no leak is found, try draining and refilling the unit and then restarting the heat pump and seeing what the delivery pipe temperature is. If the problem persists, replace the compressor.
6. The built-in overheating protection (bi-metal protection) in the compressor has tripped.	Check if the heat pump's control computer indicates that the compressor is in operation, and if there is voltage between soft-starters A1 and A2. Then read off and check that there is voltage on the compressor's three electrical connections (L1, L2 and L3).	If there is voltage on the compressor's three electrical connections and the overheating protection does not close when the compressor has not run and has cooled down for at least 1 hour, replace the compressor.
7. The compressor runs backwards. The incoming phases have the incorrect sequence (only applies to 3-phase heat pumps). If the compressor runs backwards, it will not cope with compressing the refrigerant and therefore does not produce the correct power, which leads to the control computer requesting auxiliary heating.	• If the text ERR PHASE SEQ appears in the display when the heat pump is powered, (only appears in the first 10 minutes) this means that the phases have the incorrect sequence. • When the compressor is running, check the delivery pipe temperature by feeling the delivery pipe that should be hot (not just warm) even a little distance from the compressor if the phases are correctly sequenced. • When the compressor runs with the phases incorrectly sequenced a strange noise may be heard (loud, rattling) when the compressor runs backwards.	If the phases are in the incorrect order, switch two incoming phases at the main terminal block and recheck according to the troubleshooting window.

Problem – The heat pump consumes too much energy

Cause	Troubleshooting	Remedy
1. Blocked strainer in the heating system.	Check that the strainer is not blocked.	Clean the strainer if necessary.
2. The compressor cannot run due to an alarm.	Check the alarm that is indicated in the display.	Rectify the problem and reset the alarm. See the "Operational problem – Alarm" section.
3. Incorrect flow over hot side of the heat pump.	Measurement check what the difference between the supply and return pipe is using a thermometer (Δt). The difference should be about 7-10°C (can vary depending on refrigerant). A lower Δt results in reduced efficiency in the heat pump.	Adjust the system to obtain the correct Δt .
4. Incorrect flow in the brine circuit.	Measurement check what the difference between the supply and return pipe is using a thermometer (Δt). The difference should not be more than 4°C. A greater Δt results in reduced efficiency in the heat pump.	If the difference is greater than 4°C note what is causing it. E.G.: Dirt in the filter, system restrictions, system with high pressure drop.

Cause	Troubleshooting	Remedy
5. The heat pump's control computer is not set/adjusted to the customer's requirements/wishes.	Check the ROOM and CURVE and MIN settings.	Adjust incorrect values in the heat pump's control computer. ROOM = Desired indoor temperature. CURVE = Should be set so that the desired indoor temperature (ROOM) is maintained regardless of the outdoor temperature. MIN = Lowest set-point value on the supply pipe regardless of the outdoor temperature.
6. The interval for peak heat operation has changed to a lower value than the factory set value. This results in the heat pump going into peak heat operation more often than calculated.	Check the specified interval for peak heat operation in the control computer, see instructions for relevant model.	If there is a shorter interval between the peak heat productions, this explains why the unit consumes more current than calculated, but this does not mean for sure that it should be increased, there might be a reason why the interval has been changed.
7. The heat pump has stopped on HIGH RETURN.	• Check what the MAX RETURN value is set at in the heat pump's control computer. It must be adjusted to the unit's maximum supply temperature and the system's delta temperature so that it does not cut at too high a return temperature when the highest supply temperature is transmitted. • Check what the return pipe sensor shows, is it a plausible/actual value? If not, take a resistance reading from the sensors and check against the ohm table in the "Measurement points" section.	If the MAX RETURN value is not adjusted for the system according to the troubleshooting window, adjust it. If the sensor is defective, replace it.
8. The compressor runs backwards. Incoming phases are in the incorrect order. If the compressor runs backwards, it will not cope with compressing the refrigerant and therefore does not produce the correct power, which leads to the control computer requesting auxiliary heating.	• If the text ERR PHASE SEQ appears in the display when the heat pump is powered, (only appears in the first 10 minutes) this means that the phases have the incorrect sequence. • When the compressor is running, check the delivery pipe temperature by feeling the delivery pipe that should be hot (not just warm) even a little distance from the compressor if the phases are correctly sequenced. • When the compressor runs with the phases incorrectly sequenced a strange noise may be heard (loud, rattling) when the compressor runs backwards.	If the phases are in the incorrect order, switch two incoming phases at the main terminal block and recheck according to the troubleshooting window.
9. The compressor has been stopped by the operating pressure switch or delivery pipe sensor.	Check if a square appears in the display's lower left corner, if so, the operating pressure switch is open or the delivery pipe sensor triggers an alarm for too high temperature. • The operating pressure switch is most easily checked by using a buzzer to see if it is connected. • The delivery pipe sensor value is read off from the control computer in the HEATPUMP menu. Is it a plausible/actual value? If not, take a resistance reading from the sensor and check against the ohm table in the installation instructions. • The compressor has been stopped by the delivery pipe sensor and you have established that it shows the correct temperature. This may have been caused by a leak in the refrigerant circuit.	If the operating pressure switch has stuck in the open position, try gently tapping on the pressure switch head. If this does not help, or it sticks in the open position repeatedly, replace the pressure switch. If the delivery pipe sensor is defective, replace it. If the delivery pipe temperature gets so hot that the compressor stops, start by leak-tracing the unit. Rectify the leak, if a leak is found. If no leak is found, try draining and refilling the unit and then restarting the heat pump and seeing what the delivery pipe temperature is. If the problem persists, replace the compressor.
10. Expansion valve defective or incorrectly set.	Using manometer apparatus and thermometer check what the overheating reading of the unit is. Also check that bulb and capillary tube are undamaged and that the bulb is correctly installed.	If the overheating reading does not correspond with the instructions for the specific refrigerant, adjust the expansion valve until the correct value is obtained. See separate instructions for cooling techniques. If overheating cannot be adjusted with the expansion valve or if the capillary tube/bulb is damaged, replace it.

Cause	Troubleshooting	Remedy
11. Lack of refrigerant, not enough refrigerant in the system.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant. Then check in the same way that the unit's cooling is correct. See separate instructions for cooling techniques.	If cooling is not at the correct level compared with the specific refrigerant and is too low, there is insufficient refrigerant in the unit. Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant. If there appears to be a leak in the refrigerant circuit, carry out leak tracing and any necessary corrective action. If leak tracer is not available, brush soap water on the suspected leak and look for bubbles. Also check for oil as this can come out from the refrigerant circuit.
12. Overfilled refrigerant circuit.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant. Then check in the same way that the unit's cooling is correct. See separate instructions for cooling techniques.	If cooling is not at the correct level compared with the specific refrigerant and is too high, there is too much refrigerant in the unit. Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant.
13. Short active collector, e.g. short or dry bore hole, short surface soil collector.	- Check the length of the collector that is being used and compare with the collector length in the dimensioning documentation. - In addition, check that the collector is not suspended "in free air" if boreholes are used.	If the active collector is too short, the heat pump cannot receive enough energy from the heat source, which results in it requiring an addition to cover the energy requirement.
14. Changed conditions. Have you increased your heating and/or hot water demand?	- If the heat pump has been dimensioned for a certain demand and this demand is increased, the heat pump might not be able to maintain the desired room temperature. - If hot water consumption increases, a larger proportion of time is used to produce hot water, which means less time for heat production (only applies to VL-systems).	If the heat pump cannot cope with the demand, replace it with one with a higher output or supplement it with a higher output auxiliary heater.

Problem – Auxiliary heater cuts in too soon

Cause	Troubleshooting	Remedy
1. The heat pump's control computer is not set/adjusted to the customer's requirements/wishes.	Check the ROOM, CURVE, INTEGRAL A1 and INTEGRAL A2 settings	Adjust incorrect values in the heat pump's control computer. ROOM = Desired indoor temperature. CURVE = Should be set so that the desired indoor temperature (ROOM) is maintained regardless of the outdoor temperature. INTEGRAL A1 = Start value for the compressor. INTEGRAL A2 = Start value (calculated from A1) for the auxiliary heater.
2. Lack of refrigerant, not enough refrigerant in the system.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant. Then check in the same way that the unit's cooling is correct. See separate instructions for cooling techniques.	If cooling is not at the correct level compared with the specific refrigerant and is too low, there is insufficient refrigerant in the unit. Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant. If there appears to be a leak in the refrigerant circuit, carry out leak tracing and any necessary corrective action. If leak tracer is not available, brush soap water on the suspected leak and look for bubbles. Also check for oil as this can come out from the refrigerant circuit.
3. Short active collector, e.g. short or dry bore hole, short surface soil collector.	- Check the length of the collector that is being used and compare with the collector length in the dimensioning documentation. - In addition, check that the collector is not suspended "in free air" if boreholes are used.	If the active collector is too short, the heat pump cannot receive enough energy from the heat source, which results in it requiring an addition to cover the energy requirement.
4. Collector too long, pressure drop too great.	Check the length of the collector that is being used and that it is connected in parallel (not connected in series) if more than 1 coil is being used.	If a longer collector is being used than recommended for the specific heat pump, it must be divided on several parallel connected coils.

Cause	Troubleshooting	Remedy
5. Changed conditions. Have you increased your heating and/or hot water demand?	• If the heat pump has been dimensioned for a certain demand and this demand is increased, the heat pump might not be able to maintain the desired room temperature. • If hot water consumption increases, a larger proportion of time is used to produce hot water, which means less time for heat production (only applies to VL-systems).	If the heat pump cannot cope with the demand, replace it with one with a higher output or supplement it with a higher output auxiliary heater.

Problem – Short operating times despite heating demand

Cause	Troubleshooting	Remedy
ROOM and/or CURVE set too high in combination with a heating system with poor circulation due to closed radiator valves, too small elements or insufficient water volume. A tight fitting system with poor pipe dimensions may produce the same phenomena.	Check if the heat pumps starts, if the supply temperature rises quickly whilst nothing happens to the return temperature. If this happens and the heat pump is stopped by the hysteresis function to later drop in temperature (supply) as quickly to start again, but cannot due to time conditions in regulation, this means that the heat pump cannot transport the heat away from the condenser as it should. In such a case, hysteresis starts and stops the heat pump often.	Adjust ROOM and CURVE if necessary, ensure that there is sufficient flow over the condenser and the heating circuit.

Problem – Connection of external AH

Cause	Troubleshooting	Remedy
Incorrectly connected auxiliary heater. Does not start when the control computer gives the signal.	Check the connection against the instructions/wiring diagram. Test the function in manual mode.	If the auxiliary heater is incorrectly connected, reconnect according to the instructions.

14.9 Operational problem – Outdoor unit

Problem – Noise/loud noise

Cause	Troubleshooting	Remedy
1. Positioning the outdoor unit.	Determine whether the outdoor unit can be moved to a more suitable location.	When positioning the outdoor unit, its direction does not affect its performance. The outdoor unit does not need to be positioned as close to the heat pump as necessary, it can be positioned as far as 30 "pipe metres" way.
2. Connection/wall lead-ins.	Check that the unit is installed according to the instructions. Is the outdoor unit secured to the wall?	Rigid mountings can generate noise from the outdoor section via walls in the house.

Problem – Defrosting problems

Cause	Troubleshooting	Remedy
1. Location/calibration of the outdoor sensor.	Check that the outdoor sensor is installed according to the installation instructions and that it is correctly calibrated.	Install according to the instructions and calibrate, if necessary. Alternatively, the outdoor sensor can be located behind the outdoor unit 20 cm out from the rear side of the outdoor unit.
2. Brine temperature in/out.	Measurement check the temperatures with a thermometer.	If necessary, calibrate BRINE IN and BRINE OUT in the heat pump's control computer.

Problem – Build-up of ice under and around the outdoor unit

Cause	Troubleshooting	Remedy
Insufficient drainage.	Does a lot of ice accumulate under and around the outdoor unit because the melted water has no where to run?	Drain the ground under and around the outdoor section or Install a drip tray with a drainpipe routed to an indoor drain or gully. NOTE! A heating cable may have to be installed in the drainpipe.

Problem – Water run-off by the outdoor unit, risk of moisture problems in house foundations

Cause	Troubleshooting	Remedy
Insufficient drainage.	During some periods when the outdoor unit is being defrosted, large amounts (20-40 L/day) of water can run off.	Drain the ground under and around the outdoor unit so that it can cope with the extra amount of water produced because of defrosting or Install a drip tray with a drainpipe routed to an indoor drain or gully. NOTE! A heating cable may have to be installed in the drainpipe.

15 Technical data

DHP-AL	6	8	10	12
Refrigerant type	R404A	R404A	R404A	R404A
Refrigerant, kg	0.95	1.45	1.40	1.60
Electrical connection, V	400V 3-N	400V 3-N	400V 3-N	400V 3-N
Rated max output, comp. kW	2.0	2.3	3.6	4.4
Compressor+AH ^{2) 3) 4)}				
Electric heating element, kW	3/6/9/12/15	3/6/9/12/15	3/6/9/12/15	3/6/9/12/15
Fuse, A	10 ³⁾ /16 ⁴⁾ /20 ⁵⁾	16 ³⁾ /16 ⁴⁾ /20 ⁵⁾	16 ³⁾ /16 ⁴⁾ /20 ⁵⁾	16 ³⁾ /20 ⁴⁾ /25 ⁵⁾
Fuse, A cont.	20 ⁶⁾ /25 ⁷⁾	20 ⁶⁾ /25 ⁷⁾	20 ⁶⁾ /25 ⁷⁾	25 ⁶⁾ /25 ⁷⁾
Specified output, kW ¹⁾	6.7/6.1	9.4/8.4	11.3/10.1	13.1/11.9
Efficiency incl. circ.pump and fan ¹⁾ , COP	3.7/2.5	4.0/2.8	3.7/2.7	3.9/2.8
Specified output, kW ²⁾	3.2/3.0	4.5/4.0	5.5/5.0	6.5/6.0
Efficiency incl. circ.pump and fan ²⁾ , COP	1.9/1.4	2.0/1.6	2.0/1.6	2.0/1.6
Lowest outside temperature for compressor operation (exterior stop)	-20°C	-20°C	-20°C	-20°C
Fan speed, 2 speed:, rpm	340/650	340/650	575/925	575/925
Air flow, m ³ /h	1600/3000	1600/3000	3000/4500	3000/4500
Noise level, dB(A) ⁸⁾				
- 1 m from the unit	44/52	44/52	47/60	47/60
- 8 m from the unit	29/37	29/37	32/45	32/45
- 16 m from the unit	24/32	24/32	27/40	27/40
Nominal flow				
- brine, lit/s	0.32	0.49	0.58	0.66
-heat transfer fluid, kPa	0.15	0.21	0.25	0.29
External available pressure ⁹⁾				
-brine, kPa	79	63	47	57
-heat transfer fluid, kPa	112	110	112	106
Weight, heat pump/outdoor section, kg	154/80	154/80	154/80	162/80
Max. Pipe length (Ø28mm) total between indoor and outdoor unit, m	60 (30+30)	60 (30+30)	60 (30+30)	60 (30+30)

¹⁾ Tested at outdoor air temperature / heating medium out 7/35°C and 7/50°C (excluding circulation pumps and fan).

²⁾ Tested at outdoor air temperature / heating medium out -20/35°C and -20/50°C (excluding circulation pumps and fan).

³⁾ Heat pump with 3 kW auxiliary heater

⁴⁾ Heat pump with 6 kW auxiliary heater

⁵⁾ Heat pump with 9 kW auxiliary heater

⁶⁾ 12kW auxiliary heater

⁷⁾ 15kW auxiliary heater

⁸⁾ Noise level measured at SEMKO according to EN ISO 3744

⁹⁾ The pressure that must not be exceeded outside the heat pump without falling below the nominal flow.

